installation and user guide

hp StorageWorks command view sdm

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WARNING	Identifies a hazard that can cause personal injury
Caution	Identifies a hazard that can cause hardware or software damage
Note	Identifies significant concepts or operating instructions

`this font` - used for all text to be typed verbatim: all commands, path names, file names, and directory names also, text displayed on the screen

<*this font*> - used for variables used in commands

this font - used for GUI menu options and screen controls

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Revision History

September 2001

Change	Page
Added installation configuration drawings.	41
Added HP-UX 11.20 to native supported operating systems.	19, 40
Changed procedure for implementing browser security.	94
Added command line task summary table.	108

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Change	Page
Updated WWN information to indicate that either the port WWN or the node WNN can be used to identify a host.	Multiple
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Added HP OpenView Storage Area Manager configuration.	43
Added information on using script files to start and stop HostAgent and OpenDIAL.	67
Added details about the software installation process.	71
Removed -f option from armdiscover command.	123
Added performance metrics table.	162
Added -cp and -t options to armsecure command.	202
Added Problem Solving chapter.	245

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Change	Page
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Added SunCluster to host port behaviors.	150

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Change	Page
Updated contents to reflect that a hardcopy of the Command View SDM User Guide is no longer included.	14
Corrected paths to HA_DIAL_START and HA_DIAL_STOP.	67
Added host port behavior table management to the Command View VA GUI.	104
Added host port (H1, H2) and disk enclosure port (J1, J2) subcomponent parameters to the FRU Location Identifier values.	112
Added armdiag command used for advanced troubleshooting.	120
Added new functionality to the armdsp -p option for HP15. Added -ps option and -vfp option to armdsp command for displaying VFP settings. Added the -b and -v options to the armdsp -i command.	131
Added note on host port behavior entry limitations. Added new options to armhost command to aid in creating the host port behavior table.	144
Added -pg and -sv options to armlog command to aid in filtering logs. Also added -xml output option.	148
Added -P, -S, and -pv options to armmgr command.	150
Added -f option to armrecover command to perform a parity scan.	199
Updated Configure and Configure Fiber portions of CVUI menu map.	218
Added -xml output option to logprn command.	225
Added section "Using Command View SDM on a Serial Port"	249

November 2002

Change	Page
Added more information on installing on OpenView SAM.	49
Added information on renaming host	69
Added information on VA 7410 firmware version numbering.	128
Added -Core option to armdiag command.	120
Added DISK-PORTS metrics to performance metrics table.	162
Added information on using the armrecover command	200
Added armshell command	206

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Change	Page
Added VA 7110.	Multiple
Removed Enterprise Intergrations as a stand-alone product. It is now shipped with Command View SDM.	18

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Change	Page
Added note on using the GUI through a firewall.	87
Added note regarding the deletion of very large LUNs potentially causing timeouts.	101, 115
Added Security Information	88
Added licApp, licUtil, and secadim commands	240, 242, 77
Added security information	88
Added license chapter	235
Added information on supported W2K SP and HP11.23 support	19
Added multiple IP address note for HP-UX, Windows, and Linux	45, 49, 55

Change	Page
Added information on HP StorageWorks SMI-S VA	75

contents

1 Product Description 13

HP StorageWorks Command View SDM Software 14
- The Software Components 14
- Event Reporting Software 15

HP StorageWorks SMI-S for Command View VA disk arrays 17
- Non-Native Supported Operating Systems 20
- Sources of Support Information 21

Technical Support and Manual Updates 22

HP SOFTWARE LICENSE TERMS 23

Sun Microsystems, Inc. Binary Code License Agreement 31
- END-USER LICENSE AGREEMENT FOR SITRAKA INC. JCLASS PRODUCTS 33

2 Installing Command View SDM 39

- Upgrading to a Newer Version of Command View SDM 39

Command View SDM Installation Configurations 40

Installing Command View SDM on HP-UX 44
- Minimum System Requirements for HP-UX 44
- Installation Steps 45
- Uninstalling Command View SDM from HP-UX 47
- HP-UX System Support Software 48

Installing Command View SDM on Windows 49
- Minimum System Requirements for Windows 49
- Installation Steps 51
- Setting Up the Launcher on a Remote Client 52
- Uninstalling HP Command View SDM Software from Windows 54

Installing Command View SDM on Linux Red Hat 55
- Minimum System Requirements for Linux Red Hat 55

Installation Steps 56
Uninstalling Command View SDM from Linux 58
Saving and Restoring Array Configuration Information 60
Restoring Array Configuration Information 61
Configuring Command View SDM 62
Setting up Remote Client Access 62
Configuring the Command View SDM Web Server 63
Enabling EMS Monitoring 64
Setting the System Display Variable 65
Verifying the Installation 66
Starting/Stopping HostAgent and OpenDIAL 67
Creating LUN 0 68
Adding a New Host to the Management Configuration 69
Renaming a Host 69
Details About the Command View SDM Installation Process 71
Command View SDM Architecture 71
The Installation Process 73
File Directory Structure 73
HP StorageWorks SMI-S VA (Storage Management Initiative Specification) 75
Introduction 75
Supported Operating Systems 75
Installing SMI-S VA 75
Starting and Stopping SMI-S VA 75
Configuring SMI-S VA 76
VAProvider.hpcfg 77
Passwords 78
Configuring JAAS 79
SLP DAEMON Installer 81
Binaries Location on the Web and CD 81
Solving Installation Problems 83
Managing Passwords for VA LUN Security/ LUN Masking Access 84

3 Using the Graphical User Interface 87

The GUI Components 87
Running the Command View SDM GUI 88

User Security 88
Enabling User Security 88
Configuring User Security 88
Default User Name and Password 89
Configuring User Security Using the Launcher 89
Login Screen 93
Running the Launcher from the Windows Icon 93
Running the Launcher Using a Command Line 93
Running the Management GUI Directly from a Command Line 94
Running the Launcher from a Web Browser 94
Running the Management GUI Directly from a Web Browser 95
Running the Management GUI from an OpenView SAM Management Station 95
Using the Command View SDM GUI 96
Locating Information 96
Performing Management Tasks from the GUI 100
Checking Array Status 100
Managing Array Capacity 100
Using Secure Manager 102
Managing Host Port Behavior Table 104

4 Command Line User Interface 107

Command Summary 108
Command Syntax Conventions 110
Command View SDM man pages 110
Quick Help 110
Using Identification Variables 111
Array Identifier 111
FRU Identifiers 112
Command View SDM Commands 114
armcfg 115
armcopy 118
armdiag 120
armdiscover 123
armdownload 126
armdsp 131

armfeature 141
armfmt 143
armhost 144
armlog 148
armmgr 150
armperf 159
armrbld 197
armrecover 199
armsecure 202
armshell 206
armtopology 209
secadmin 212

5 Command View SDM User Interface 215

Starting the Command View SDM CVUI 216
CVUI Example 216
CVUI Menu Map 218

6 Array Logs 221

Managing the Size of the Log Files 223
Log Commands 224
logprn 225
logdel 228
armlog 230
About Log Files 231
Directory Structure 231
Performance Logs 233
Port Statistics Log 233
Managing the Size of the Performance Log Files 233

7 Array Licenses 235

The InstantOn License Key 235
Obtaining Permanent License Keys 236
Obtaining License Keys via the Graphical User Interface (licApp) 236
Obtaining License Keys via the Web 236
Obtaining License Keys via Email, Phone, or Fax 237

Installing License Keys 237
License Command Locations 238
Array License Commands 239
licApp 240
licUtil 242

8 Solving Problems 245

9 Using Command View SDM on a Serial Port 249

Connecting to the Array Using a Serial Port 250
Running Command View SDM on the Serial Port 251
Starting the Command View SDM GUI 251
Starting the Command View SDM CLUI 251

Product Description

1

HP StorageWorks Command View SDM is designed to provide storage management for the HP StorageWorks Virtual Array products. Command View SDM provides simple yet sophisticated device management tools for the array. Some of the features and benefits offered by Command View SDM include:

- Lets you manage an unlimited number of HP virtual arrays from a graphical user interface (GUI), command line user interface (CLUI), or web browser.
- The GUI uses Java technology to create a common application for all supported operating systems
- Provides secure device management in both direct-attach and SAN environments.
- Easily spans your storage system as it grows from entry level to midrange and enterprise-wide.
- Goes from out-of-the-box to up-and-running faster than any other device management solution.
- Includes a one-host license to use - add additional host licenses as your network grows.
- Provides web-browser support.

HP StorageWorks Command View SDM Software

The Command View SDM product includes the following items:

- *HP StorageWorks Command View SDM* CD
- License-to-Use (1 Host)

The Software Components

The *Command View SDM CD-ROM* contains all the software required to manage the HP StorageWorks Virtual Array products. The software components include:

- **Installers** - provided for Windows (NT 4.0 and 2000), HP-UX, and Linux Red Hat.
- **Command View SDM Utilities** - the underlying code, these utilities are invoked by the user interfaces to perform all array management tasks.
- **Three User Interfaces**
  - Graphical User Interface (GUI) - a Java-based interface that simplifies array management. Most management tasks can be done using the GUI.
  - Command Line User Interface (CLUI) - a full suite of commands that provide access to the full capability of the management utilities.
  - Command View SDM User Interface (CVUI) - adds a menu-based text interface front end to the command lines. This interface provides access to full command line functionality without requiring you to memorize all the commands and options.

Note The Virtual Front Panel (VFP) provides another option for performing some of the array management and configuration tasks. The VFP is embedded in the array controller firmware and is not included with the other user interfaces on the CD.

- **HostAgent & OpenDIAL Services (or daemons)** - these services control the operation of the Command View SDM software. OpenDial is responsible for discovering what arrays are visible to the host, and HostAgent manages the server components of the software.

  If Command View SDM is installed on a Windows host that is running HP OpenView Storage Area Manager, the HostAgent and OpenDial services

are not used. The HP OpenView Storage Management Server service is used to integrate the Command View SDM software with OpenView.

- **README file** - contains updated support and installation information
- **Book files** - electronic copies of the product documentation are included for your convenience.

Event Reporting Software

The internal operation of the array is continually monitored and any significant events are recorded. Command View SDM internal event reporting software retrieves event information from the array and reports it to the user. Command View SDM event software broadcasts these events to platform dependent targets using SNMP applications with an SNMP agent to trap the events. Command View SDM also stores these events to system log files.

Note Command View SDM does not support the SNMP set feature. Device information cannot be configured from a remote host.

Event targets include the following. Note that integration into some of these applications requires the use of the Enterprise Integrations software, which is included with Command View SDM.

- Windows
  - Event Viewer
  - HP OpenView NNM (SNMP)
  - HP Top Tools (SNMP)
  - CA Unicenter TNG (SNMP)
  - BMC Patrol (SNMP)
  - Tivoli (SNMP)
  - HP EMS
  - Instant Support Enterprise Edition
- Linux
  - Syslog
  - HP EMS
  - Instant Support Enterprise Edition
- HP-UX
  - Syslog
  - HP EMS

- HP OpenView NNM (SNMP)
- HP Top Tools (SNMP)
- CA Unicenter TNG (SNMP)
- BMC Patrol (SNMP)
- Tivoli (SNMP)
- Instant Support Enterprise Edition

Events are categorized as Information, Minor Warning, Major Warning, Serious, and Critical. These events also provide descriptions useful for troubleshooting. A current list of events is available from the HP web site:

```
http://docs.hp.com/hpux/content/hardware/ems/
RemoteMonitor.htm
```

HP StorageWorks SMI-S for Command View VA disk arrays

Hewlett-Packard proudly supports the new storage standard called the Storage Management Initiative Specification (SMI-S). Hewlett-Packard is a contributing member of the Storage Networking Industry Association (SNIA), which is a technical organization chartered to build seamless multi-vendor storage management networks.

The SMI-S specification standardizes the interface for SAN management, device control architectures and associated interfaces. It enables Hewlett-Packard to ultimately develop products to a single standard interface eliminating the need for custom/manual integration of Hewlett-Packard storage solutions into multi-vendor environments.

Hewlett Packard supports the new storage standard called the Storage Management Initiative Specification (SMI-S). Hewlett Packard is a contributing member to the Storage Networking Industry Association (SNIA), which is a technical organization chartered to build seamless multi-vendor storage management networks.

The SMI-S specification standardizes the interface for SAN management, device control architectures and associated interfaces. The SMI-S specification enables storage vendors to develop products to a single interface that eliminates the need for custom integration by end users to integrate storage devices into their environment.

To ensure that the standard has been properly implemented, SNIA has created a series of independent third-party conformance tests that verify the accuracy of the vendor's implementation. Hewlett Packard was one of the first storage vendors to successfully exit the SNIA conformance testing program.

Secondary benefits of Hewlett-Packard's support for SMI-S are:

- Simplification of your storage management environment enabling you to focus on your business not managing your storage
- Reduction in cost to deploy new storage technologies by reducing the need for dedicated staff experts for each storage vendor's solution
- Increased stability of new storage technologies resulting is greater confidence to implement these technologies
- Minimize contention between vendors

- Ability to implement larger storage infrastructures with current staff

For white papers or technical discussions on the SMI-S standard, please go to: http://www.snia.org/smi/home.

HP Modular Storage Software Products

A full line of complementary software products are available to expand the capability of the CommandView SDM software. These optional products are listed in the following table. For the most up-to-date information about Modular Storage Software products, visit the HP web site.

CommandView SDM Modular Storage Software Products

SOFTWARE PRODUCTS
CommandView SDM Enables array configuration and management. Provides the foundation for value-added software products. Also includes Enterprise Integrations, which integrates CommandView SDM into network management applications BMC Patrol, HP Openview NNM for HP-UX/Windows/ Solaris, HP Openview VPO for HP-UX, and CA-Unicenter TNG. — Software Package and 1 Host LTU* (T1086A)
Business Copy VA Enables online data replication or LUN copying within the array for testing and backup, and requires the same physical space to be available in the array as the LUN(s) being copied. — Software Package and 50 GB LTU* (T1007A) — 500 Gbyte Upgrade (T1008A) — 1 Tbyte Upgrade (T1009A)
Secure Manager VA Enables LUNs to be locked into a secure shared environment. — Software Package and 50 GB LTU* (T1003A) — 500 Gbyte Upgrade (T1004A) — 1 Tbyte Upgrade (T1005A) — 5Tbytee Upgrade (T1006A)

Auto Path VA for Windows 2000 Enables I/O path fail-over in MSCS Windows 2000 environments with the benefit of I/O load balancing in both failed and non-failed states. — Software Package and 1 Host LTU* (T1011A) — 1 Host Upgrade LTU (T1012A) — 5 Host Upgrade LTU (T1013A)
Auto Path VA for Windows NT Enables I/O path fail-over in MSCS Windows NT 4.0 environments with the benefit of I/O load balancing in both failed and non-failed states. — Software Package and 1 Host LTU* (T1039A) — 1 Host Upgrade LTU (T1040A) — 5 Host Upgrade LTU (T1041A)
Auto Path VA for HP-UX Enables I/O path fail-over in HP-UX environments with the benefit of I/O load balancing in both failed and non-failed states. — Software Package and 1 Host LTU* (T1060A) — 1 Host Upgrade LTU (T1061A) — 5 Host Upgrade LTU (T1062A)
Auto Path VA for Linux Enables I/O path fail-over in Linux environments with the benefit of I/O load balancing in both failed and non-failed states. — Software Package and 1 Host LTU* (T1044A) — 1 Host Upgrade LTU (T1045A) — 5 Host Upgrade LTU (T1046A)
Copy Services SMI-S VA Enables snapshot creation/deletion/updation (asynchronous mirroring) of volumes. — Software Package and 1 Host LTU (T1076A)

* - License to Use

Operating System Support (Native)

The Command View SDM software is supported on the following operating systems. Because hosts running these operating systems can both access the

array and also manage the array using Command View SDM, these are referred to as “native” operating systems.

- HP-UX*
- Windows NT 4.0
- Windows 2000**
- Windows Server***
- Linux Red Hat
- Red Hat Linux Advanced Server

*Command View SDM 1.07 provides support for HP-UX 11.23 (IA-64) in a non-HP OpenView environment. Command View SDM 1.07 does not support HP-UX 11.20)

**Command View SDM 1.07 provides support for Windows 2000 SP1, SP2, SP3 and SP4.

***Command View SDM 1.07 will now support Window Server 2003 (32-bit).

Installation instructions for each operating system are included in Chapter 2.

Non-Native Supported Operating Systems

In addition to the native operating system listed above, the HP StorageWorks Virtual Array products are also supported on the “non-native” operating systems listed below. Hosts running these operating systems can access data on the array; however, Command View SDM is not supported on them. Consequently, array management must be done from a host running one of the supported operating systems listed above.

- Sun Solaris
- IBM AIX
- Novell NetWare
- MPE/iX (VA 7100 only)
- HP-UX 10.20

Note Command View SDM 1.07 provides support for HP-UX 11.23 (IA-64) in a non-HP OpenView environment. Additionally, Command View SDM 1.07 does not support HP-UX 11.20)

Sources of Support Information

The README file included on the Command View SDM installation CD contains important support information you should read before installing and using the software. In addition, it is recommended that you visit the technical support web site identified in "Technical Support and Manual Updates" on page 22.

Technical Support and Manual Updates

Technical support is included with all HP StorageWorks Virtual Array products. For details regarding support information, refer to the HP Support Contract provided at the time you purchased the array.

For a list of the most current support phone numbers, go to the following HP web site. This web site also has the latest version of this book available for downloading.

http://www.hp.com/support/cvsdm

Select the contact hp link under the technical support heading for support phone numbers.

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SOFTWARE PROGRAM: HP StorageWorks Command View SDM

Product/PART NUMBER: T1086A

QUANTITY of DEVICES: 1 User

DEFINITIONS

"Software" means one or more programs capable of operating on a controller, processor or other hardware Product ("Device") and related documentation. Software is either a separate Product, included with another Product ("Bundled Software"), or fixed in a Device and not removable in normal operation ("Firmware").

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JCL5.0-LIC-STD-0105

Installing Command View SDM

2

This chapter includes procedures for installing Command View SDM on each supported operating system. The installation process differs for each operating system. Once the software is installed, operation of Command View SDM is identical on all platforms.

The Command View SDM software can be installed on a host connected directly to the array. Command View SDM can also be installed on a client for remote management. Remote clients must be assigned permission to manage the array by a Command View SDM host connected to the array.

If you would like some general information on the software installation process before you begin, see "Details About the Command View SDM Installation Process" on page 71.

Note **Can I install Command View SDM on more than one host?** The license included with the array permits you to install the software on only one host. If you want to install the software on additional hosts, you must purchase another license for each host. An additional 1-host license is available as product T1086A.

Upgrading to a Newer Version of Command View SDM

When upgrading to a newer version of Command View SDM, always uninstall the previous version before installing the new software. This will ensure that the software installation will complete successfully and that Command View SDM will operate correctly.

You should also save the Command View SDM configuration files. This will allow you to easily restore the same configuration on the new software. See "Saving and Restoring Array Configuration Information" on page 60.

Command View SDM Installation Configurations

The installation of Command View SDM is influenced by a number of factors: the type of hosts connected to the array, other network management tools in use, and your strategy for local or remote management.

There are three typical management configurations:

- **Native host** - shown in Figure 1, this configuration is typically used when a host accessing the array supports Command View SDM. Because array management can be done from this host, the need for a separate management station is eliminated.
- **Non-native** - shown in Figure 2, this configuration is typically used when the hosts accessing the array do not support Command View SDM. In this environment, Command View SDM is installed on a separate management station.
- **HP OpenView Storage Area Manager (SAM)** - shown in Figure 3, this configuration integrates Command View SDM into the OpenView SAM management architecture. The Command View software is installed on the SAM management station, allowing the array to be managed from the same point as other storage resources. The SAM HostAgent must be deployed on hosts connected to the arrays that will be managed.

Figure 1 Native Host Management Configuration

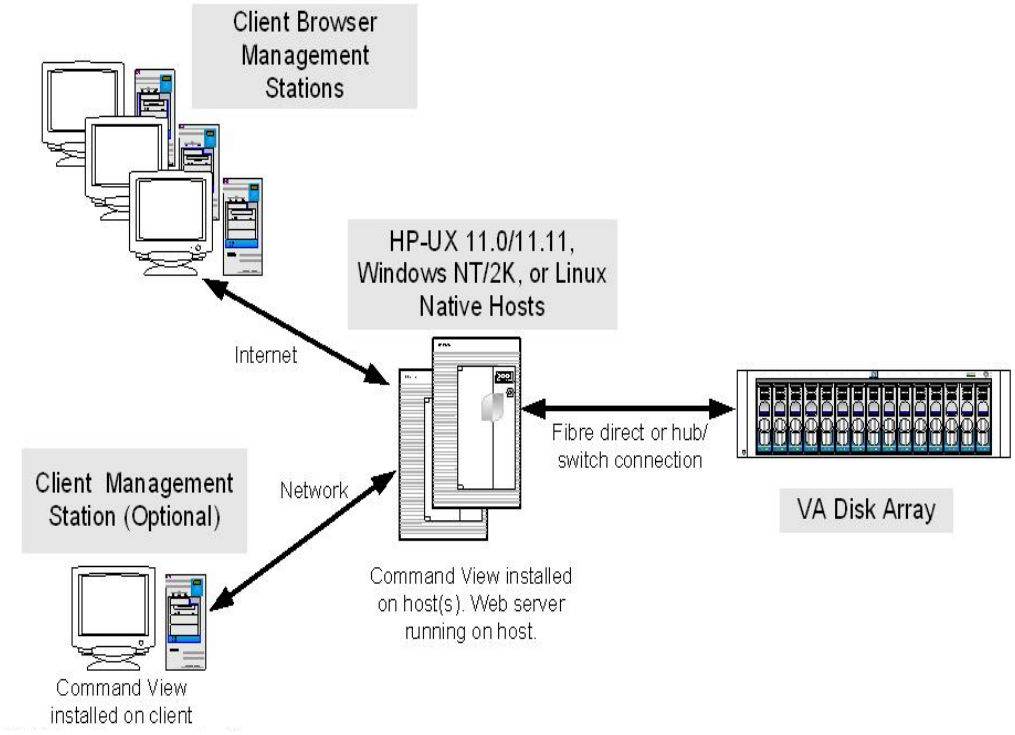

Client Browser Management Stations
HP-UX 11.0/11.11, Windows NT/2K, or Linux Native Hosts
Internet
Fibre direct or hub/ switch connection
VA Disk Array
Client Management Station (Optional)
Network
Command View installed on host(s). Web server running on host.
Command View installed on client

Figure 2 Non- Native Host Management Configuration

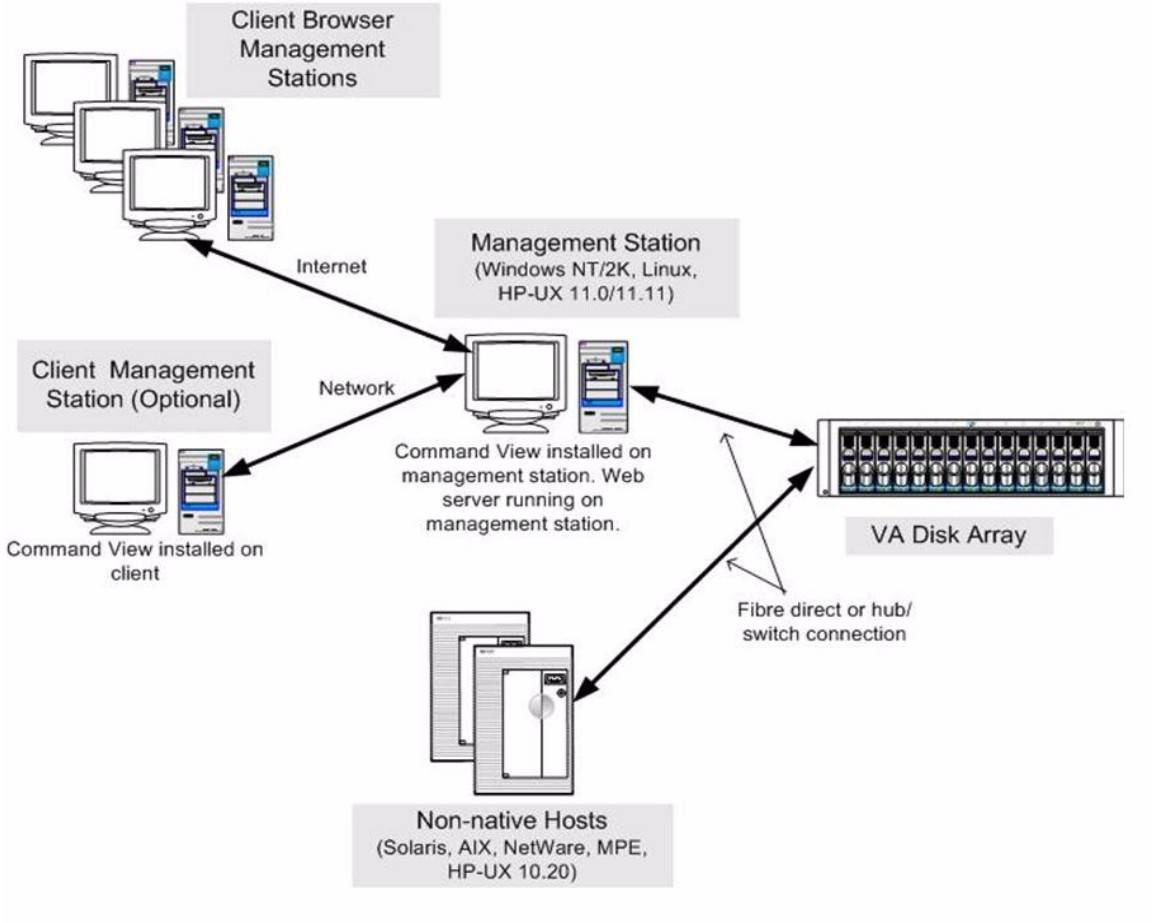
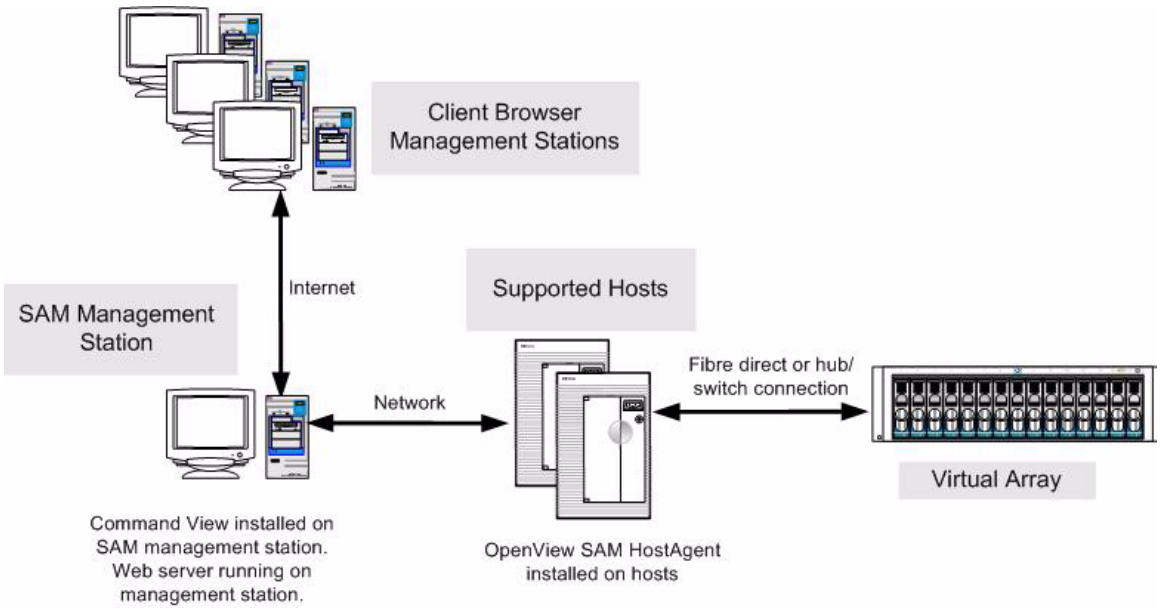

Client Browser Management Stations
Internet
Management Station
(Windows NT/2K, Linux, HP-UX 11.0/11.11)
Client Management Station (Optional)
Network
Command View installed on management station. Web server running on management station.
Command View installed on client
VA Disk Array
Fibre direct or hub/ switch connection
Non-native Hosts
(Solaris, AIX, NetWare, MPE, HP-UX 10.20)

Figure 3 HP OpenView Storage Area Manager Management Configuration



Note This configuration is not supported on HP-UX 11.23

Installing Command View SDM on HP-UX

The following procedure describes the steps involved in installing the Command View SDM software on an HP-UX host or client.

Minimum System Requirements for HP-UX

Before installing the Command View SDM software, verify that the host meets the following minimum requirements.

Host	■ HP-UX 11.0/11.11/11.23 (plus the Support Plus Hardware Enablement Bundle, version September 2001 or later) ■ RAM: 256 Mbyte ■ Screen Resolution: 800 x 600 (for the GUI) (Recommended 1024 X 768) ■ Video Support: 64K colors or better ■ Disk Space for Logs: 16 Mbyte per 2 months ■ Disk Space: 60 Mbyte in the /var directory (for logs) ■ Directory Space for installation: — /opt (230Mbyte 11.00/11.11) (350Mbyte 11.23) — /var (less than 1Mbyte for 11.00/11.11) (1.3 Mbyte for 11.23) — /etc, /usr, / (less than 1Mbyte for 11.00/11.11/ 11.23)

Locating HP-UX Patches

Support Plus Hardware/Critical Patch Bundle information can be found on the *HP-UX Support Plus* CD-ROM, or on the following web page:

http://www.software.hp.com/SUPPORT_PLUS/hwe.html

The latest Java patches for HP-UX can be downloaded from the following web site:

http://www.hp.com/products1/unix/java/infolibrary/patches.html

Selecting a Host IP Address on Systems with Multiple IP Addresses

During installations where multiple IP addresses exist on a host (i.e. multiple LAN cards in a single host), only one of the IP address will be entered into the /etc/opt/sanmgr/hostagent/config/commIpAddr.txt file. If this is not the correct address, the hostagent will not communicate with the array.

After installation, check the contents of the /etc/opt/sanmgr/hostagent/config/commIpAddr.txt file. If the correct IP address is not shown, manually enter the correct IP address.

Installation Tips

- For the latest information on installing and upgrading the software, refer to the README file on the *Command View SDM* Installation CD. The README is located in the corresponding operating system directory.
- When upgrading to a newer version of Command View SDM, always remove the previous version before installing the new software.
- Make sure EMS hardware monitoring is installed and operating on the host **before** installing Command View SDM. This will ensure that the array is automatically added to the EMS configuration and array events will be detected and reported.

Installation Steps

1. Log onto the system as root or superuser.
2. If upgrading to a newer version of Command View SDM, save any configuration files and remove the old software. See the following section.
3. Insert the Command View SDM software CD into the CD-ROM drive.
4. Identify the device file for the CD-ROM:

   ```
   ioscan -fnCdisk
   ```

5. Create a mount point directory. For example:

   ```
   mkdir /cdrom
   ```

Use a directory that does not exist

6 Mount the CD device file using the device file and directory from the preceding steps. For example:

```
mount -o ro /dev/dsk/c0t0d0 /cdrom
```

7 Run swinstall using the appropriate command:

HP-UX 11.00

```
swinstall -s /cdrom/hpux/cvsdm_11_00_v107xx.depot
```

HP-UX 11.11

```
swinstall -s /cdrom/hpux/cvsdm_11_11_v107xx.depot
```

HP-UX 11.23

```
swinstall -s /cdrom/hpux/cvsdm_11_23_v107xx.depot
```

Check the appropriate `/cdrom/hpux` directory for the complete version name of the depot file.

8 Highlight CMDVIEWSDM from the list, then Mark it for installation from the Action menu. All required Command View components will be marked for installation.

9 Start the installation by selecting Install from the Action menu. Complete the information requested on the `swinstall` screens.

Note The installation process may determine that components required by Command View SDM are aleady installed. In this case, an error message may be displayed, but it can be ignored.

10 Once the software installation is complete, log out, then log back in to reset the path.

11 If you saved the configuration files from any earlier Command View SDM installation, use them to restore the prior configuration. Before restoring the older files, you may want to compare them with newly installed files (some of the old files may be the same).

Note For installations with multiple IP addresses, see "Selecting a Host IP Address on Systems with Multiple IP Addresses" earlier in this chapter.

Controlling Access to Command View SDM Executable Files

Upon installation, the Command View SDM executable file permissions are set to all users. To restrict execution of the Command View SDM executable to root-level users only, execute the following commands as root:

```
chmod 500 /opt/sanmgr/commandview/server/sbin/*
chmod 500 /opt/sanmgr/commandview/client/sbin/*
chmod 600 /opt/sanmgr/commandview/client/sbin/*.log
chmod 600 /opt/sanmgr/commandview/client/sbin/*.txt
```

What's Next?

- If Command View SDM was installed on a host connected to an array, refer to "Configuring Command View SDM" on page 62 for additional configuration information.
- If Command View SDM was installed on a client, see "Setting up Remote Client Access" on page 62 for information on assigning client access rights.

Note Two Command View SDM daemons are installed on the client that are only required on a host connected to the array. They may be shut down on a client. To shut these daemons down, refer to "Starting/Stopping HostAgent and OpenDIAL" on page 67.

Uninstalling Command View SDM from HP-UX

This procedure describes uninstalling the Command View SDM software. The existing Command View SDM software should be removed before installing a new version of the software. The uninstall process does not automatically delete the array log files. If you want to delete the log files, you will have to do so manually.

1. Log onto the system as root or superuser.
2. If you are upgrading to a newer version of Command View SDM, save any configuration files you may have customized. See "Saving and Restoring Array Configuration Information" on page 60.
3. Display the software available for removal:

   ```
   swremove
   ```

4. Select the following components for removal:

   ```
   CMDVIEWSDM
   ```

```
HPOVLIC
HPOVSAMDA
HPOVSAMHA
HPOVSAMJR
HPOVSAMSG
SMI-S_VA
SSLIC
```

5 Remove the components.

Note If any of the components selected for removal are required by other applications, the component will not be removed and an error message will be displayed. This message can be ignored.

Note If you may need the contents of the existing log files, do not perform the next step. The log files may be useful in isolating problems you may have been experiencing with the array.

6 Remove the log files using the following commands:

```
rm -fR /opt/sanmgr
rm -fR /etc/opt/sanmgr
rm -fR /var/opt/sanmgr
```

HP-UX System Support Software

In addition to Command View SDM, there are additional HP-UX applications that can be used to manage and diagnose storage devices. These applications either integrate with Command View SDM, or they provide their own management options. These applications include:

- System Administration Manager (SAM)
- Support Tools Manager (STM)
- Off-Line Diagnostic Environment (ODE)

The *HP-UX Support Plus CD-ROM* (June 2001 or later) includes the versions of these applications that support the HP StorageWorks Virtual Array products.

Installing Command View SDM on Windows

The following procedure describes the steps involved in installing the Command View SDM software on a Windows NT 4.0/Windows 2000 host or client.

Minimum System Requirements for Windows

Before installing the Command View SDM software, verify that the host meets the following minimum requirements.

Host	■ Administrator privileges (Required) ■ Windows NT 4.0 with Service Pack 6a or Windows 2000 with Service Pack 1 or 2 ■ 500 MHz processor speed or better ■ 256 Mbyte RAM ■ Screen resolution 800 x 600 (for GUI use) (Recommended resolution: 1024 X 768) ■ Video support: 64K colors or better ■ Disk space for logs: 16 Mbyte per 2 months ■ Disk space: 60 Mbytes of permanent space for the application 30 Mbytes of temporary space in the Windows Temp directory (typically C:/Temp) used during installation

Selecting a Host IP Address on Systems with Multiple IP Addresses

During installations where multiple IP addresses exist on a host (i.e. multiple LAN cards in a single host), only one of the IP address will be entered into the <INSTALLDIR>\hostagent\config\commlpAddr.txt file. If this is not the correct address, the hostagent will not communicate with the array.

After installation, check the contents of the <INSTALLDIR>\hostagent\config\commlpAddr.txt file. If the correct IP address is not shown, manually enter the correct IP address.

Installation Tips

- For the latest software updates, refer to the README file on the *Command View SDM* CD. The README is located in the corresponding operating system directory.
- When upgrading to a newer version of Command View SDM, always remove the old software and save any configuration files.

HP OpenView Storage Area Manager Integration

The Command View SDM software integrates into HP OpenView Storage Area Manager (SAM) running on a Windows management station. The process of installing the software on OpenView SAM is the same as on a standard WIndows environment, however you should be aware of the following operational differences when installing on an OpenView SAM management station:

- The Command View software is only installed on the OpenView SAM management station.
- When installing Command View SDM on an OpenView SAM management station, make sure that SAM is installed before installing Command View SDM.
- The OpenView SAM Host Agent must be installed on servers connected to the arrays that will be managed.
- When upgrading OpenView SAM, Command View SDM must be uninstalled before performing the upgrade, and then reinstalled when the upgrade is complete.
- The file used to control client access on OpenView SAM is authorizedClients.dat located in the following directory `\sanmgr\managementserver\config\`.
- The Command View HostAgent and OpenDIAL services are not used on an OpenView SAM management station. Instead, the OpenView Storage Management Server service is used for the Command View SDM software.
- OpenView SAM is supported on the following versions of Command View:
  - OVSAM 2.1 is supported with Command View 1.03/1.04
  - OVSAM 2.2 is supported with Command View 1.05 and 1.06
  - OVSAM 3.0 is supported with Command View 1.06

Installation Steps

1. Make sure that SAM is installed and that the SAM Host Agent has been installed on the hosts connected to the array. See "Installing the SAM HostAgent on OpenView SAM" below.
2. Insert the *Command View SDM* CD into the CD-ROM drive on the host.
3. If upgrading to a newer version of Command View SDM, save any configuration files and remove the old software. See the following section.
4. From the Start menu, select Run.
5. Enter the letter of your CD-ROM drive, followed by `win\setup.exe`. For example, if your CD-ROM drive is "E", enter:

   ```
   E:\win\setup.exe
   ```

6. Follow the instructions to complete the installation.
7. If you saved the configuration files from any earlier Command View SDM installation, use them to restore the prior configuration. Before restoring the older files, you may want to compare them with newly installed files (some of the old files may be the same).

Note For installations with multiple IP addresses, see "Selecting a Host IP Address on Systems with Multiple IP Addresses" earlier in this chapter.

Once the installation is complete, an icon for the Command View SDM Launcher is placed on the desktop.

Note If the installer finds a previous installation of Command View, it will remove it. After the installer removes the previous version, it will terminate the installation. You will need to run the install program to install the new version of Command View.

Note After uninstalling Command View SDM, check to see if HP StorageWorks SMI-S VA is still installed. If it is still installed, you need to uninstall HP StorageWorks SMI-S VA.

Installing the SAM HostAgent on OpenView SAM

When installing the Command View SDM software in a SAM environment, the SAM Host Agent must be installed on hosts connected to the arrays that will be managed. The SAM Host Agent must be installed and running on a host to allow the SAM management client to detect and manage the array .

1. Launch the SAM GUI.
2. Select Tools > Manage Host Agent > Install Host Agent Software

   Refer to the SAM on-line help for more information on installing the host agent.

What's Next?

- If Command View SDM was installed on a host connected to an array, refer to "Configuring Command View SDM" on page 62 for additional configuration information.
- If Command View SDM was installed on a client, continue with "Setting Up the Launcher on a Remote Client" on page 52.

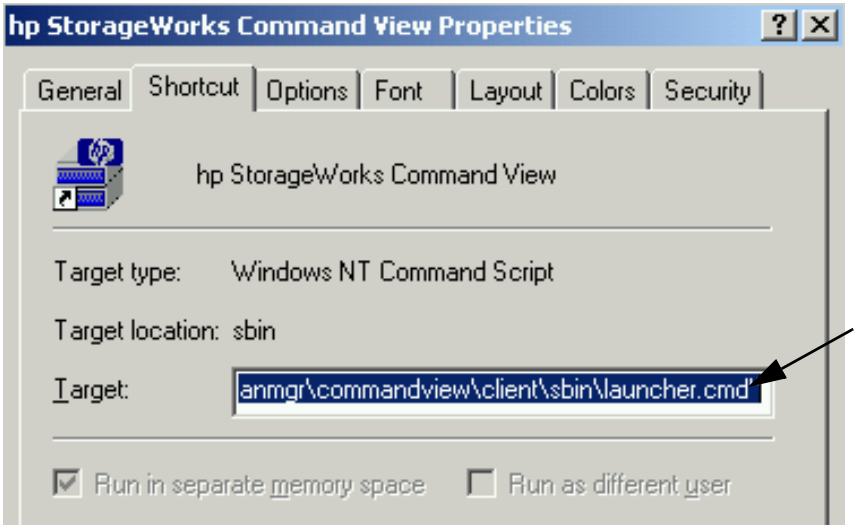
Note Two Command View SDM daemons are installed on the client that are only required on a host connected to the array. They may be shut down on a client. To shut these daemons down, refer to "Starting/Stopping HostAgent and OpenDIAL" on page 67.

Setting Up the Launcher on a Remote Client

After installing Command View SDM on a client management station, you must identify the host you want the Launcher to connect to. This will be a host running Command View SDM and connected to the array(s) you want to manage. The Launcher properties on the client must be modified to identify the desired host.

Note It is not necessary to perform this procedure if Command View SDM has been installed on a client being used for Instant Support Enterprise Edition.

1. Right click on the Command View SDM Launcher icon on the client desk top.
2. Select Properties >> Short Cut
3. In the Target: window, append a space and the host identification to the end of the path displayed. The host can be identified by either its DNS name or IP address. In the following figure, the IP address 10.62.126.238 is added to the target path.
4. Click OK.



Add the IP address or the DNS name of the CommandView host

Note

- To manage an array from a remote client, the client must be granted access by the Command View SDM host the Launcher is connecting to. See "Setting up Remote Client Access" on page 62 for more information.

- You can create additional Launcher icons connecting to different Command View SDM hosts by right clicking on the Launcher icon and selecting Create Shortcut. This will create a duplicate of the existing icon, which you can then modify to connect to a different host.

Uninstalling HP Command View SDM Software from Windows

This procedure describes uninstalling the Command View SDM software. The existing Command View SDM software should be removed before installing a new version of the software. The uninstall process does not automatically delete the array log files. If you want to delete the log files, you will have to do so manually.

1. If you are upgrading to a newer version of Command View SDM, save any configuration files you may have customized. See "Saving and Restoring Array Configuration Information" on page 60.
2. Close OpenView SAM if uninstalling on a SAM management station.
3. Select Start >> Settings >> Control Panel >> Add/Remove Programs
4. Select hp command view from the list of applications, and then click Add/Remove....

   Follow the screens to uninstall Command View SDM.

Note If there has been a problem with the software or the array, the logs should be retained and used to reference for troubleshooting. If you are certain you will not need to access the logs, they can be removed.

5. To remove the logs files, delete the following folder:

   `\sanmgr\commandview\server\logs`
6. Reboot the system when the software has been removed.

Installing Command View SDM on Linux Red Hat

The following procedure describes the steps involved in installing the Command View SDM software on a Linux Red Hat.

Minimum System Requirements for Linux Red Hat

Before installing the Command View SDM software, verify that the host meets the following minimum requirements.

Host	■ Red Hat Linux 7.1 with kernel 2.4.2 (plus patches, see web site mentioned below) ■ Intel Pentium III 500 MHz processor ■ RAM: 256 Mbyte ■ Video Resolution: 800x600 (for GUI) (Recommended 1024 X 768) ■ Video Support: 64K colors or better ■ Disk Space for Logs: 16 Mbyte per 2 months ■ Disk Space: 60 Mbyte

Where to Get the Latest Linux Information

For the most current supported Linux Kernel version and required patches for Command View SDM, refer to the web documents, "Kernel Configuration" and "Linux Tips". These documents and all the latest information can be found in the Using Your Product section of the following HP support web site:

http://www.hp.com/support/cvsdm

Selecting a Host IP Address on Systems with Multiple IP Addresses

During installations where multiple IP addresses exist on a host (i.e. multiple LAN cards in a single host), only one of the IP address will be entered into the /etc/opt/sanmgr/hostagent/config/commIpAddr.txt file. If this is not the correct address, the hostagent will not communicate with the array.

After installation, check the contents of the /etc/opt/sanmgr/hostagent/config/commIpAddr.txt file. If the correct IP address is not shown, manually enter the correct IP address.

Installation Tips.

- For the latest software updates, refer to the README file on the *HP StorageWorks Command View SDM* CD. The README is located in the corresponding operating system directory.
- When upgrading to a newer version of Command View SDM, always remove the previous version before installing the new software.
- Before installing Command View SDM, verify that the timezone system environmental variable, TZ, is properly set. If the TZ variable is not properly set before installation, the system logs may have inconsistent date stamps. If this should occur, set the TZ variable, then stop and restart HostAgent.

Installation Steps

Installation procedures for Command View SDM on Linux Red Hat consists of a set of shell scripts and rpm files that customize and install the necessary software. Prior to installing the software, the Linux Kernel must be updated using the Kernel Configuration document available on the support web site.

1. Log on as root or superuser.
2. If upgrading to a newer version of Command View SDM, remove the old software and save any configuration files. See the following section.
3. Create a directory for the software. For example:

   ```
   mkdir /tmp/cmdview
   ```

4. Insert the Command View SDM software CD into the CD-ROM drive.
5. If necessary mount the CD device file. For example:

   ```
   mount /dev/cdrom /mnt/cdrom
   ```

6. Copy the contents of the CD (or download from the web) into the directory created in step 3. For example:

   ```
   cp -pr /mnt/cdrom/linux /tmp/cmdview
   ```

7. Change directories to the /linux install directory by entering:

   ```
   cd /tmp/cmdview/linux
   ```

8 Install the software by entering:

```
install_cmdview
```

The installation will take several minutes.

Note The Host Agent installer writes a log file to `/tmp/SanMgrInstall.log`

The Command View SDM installer writes a log file to `/tmp/CommandViewInstall.log`

9 For convenience you may want to add the following line to your path variable:

```
export PATH=$PATH:/opt/sanmgr/commandview/client/sbin
```

Log out, then log back in to reset the path.

10 If you saved the configuration files from any earlier Command View SDM installation, use them to restore the original configuration. Before restoring the older files, you may want to compare them with newly installed files (some of the old files may be the same).

Note For installations with multiple IP addresses, see "Selecting a Host IP Address on Systems with Multiple IP Addresses" earlier in this chapter.

Controlling Access to Command View SDM Executable Files

Upon installation, the Command View SDM executable file permissions are set to all users. To restrict execution of the Command View SDM executable to root-level users only, execute the following commands as root:

```
chmod 500 /opt/sanmgr/commandview/server/sbin/*
chmod 500 /opt/sanmgr/commandview/client/sbin/*
chmod 600 /opt/sanmgr/commandview/client/sbin/*.log
chmod 600 /opt/sanmgr/commandview/client/sbin/*.txt
```

What's Next?

- If the software was installed on a host connected to an array, refer to "Configuring Command View SDM" on page 62 for additional configuration information.
- If the software was installed on a client, see "Setting up Remote Client Access" on page 62 for information on assigning client access rights.

Note Two Command View SDM daemons are installed on the client that are only required on the host connected to the array. They may be shut down on a client. To shut down these daemons, refer to "Starting/Stopping HostAgent and OpenDIAL" on page 67.

Uninstalling Command View SDM from Linux

This procedure describes uninstalling the Command View SDM software. The existing Command View SDM software should be uninstalled before installing a new version of the software. The uninstall process does not automatically delete the array log files. If you want to delete the log files, you will have to do so manually.

Note The 1.07 version of the Linux installer will not correctly remove earlier versions of the Command View software. Previously installed versions on Linux should be uninstalled using the uninstaller for that version of command view. If the 1.07 uninstaller is used, the following steps may be taken to ensure all unnecessary files are removed:

```
rm -fR /opt/sanmgr/hostagent
rm -fR /var/opt/sanmgr/hostagent
rm -fR /etc/opt/sanmgr/hostagent
```

1. If you are upgrading to a newer version of Command View SDM, save any configuration files you may have customized. See "Saving and Restoring Array Configuration Information" on page 60.
2. Uninstall the Command View SDM software:

```
uninstall_cmdview
```

Note If there has been a problem with the software or the array, the logs should be retained and used to reference for troubleshooting. If you are certain you will not need to access the logs, they can be removed.

3. To remove the logs, enter the following three commands:

```
rm -fR /opt/sanmgr
rm -fR /etc/opt/sanmgr
rm -fR /var/opt/sanmgr
```

If you are re-installing Command View SDM software, perform the installation procedures described under "Installing Command View SDM on Linux Red Hat" on page 55.

Saving and Restoring Array Configuration Information

Several configuration files are used to customize the operation of Command View SDM. Because these files allow you to easily replicate or restore the configuration of your array, it is recommended that you maintain copies of these files. This is particularly important if you plan to upgrade to a newer version of Command View SDM. After the new software has been installed, these files can be copied into the newly installed files to recreate the desired operating configuration. Before restoring the older files, you may want to compare them with newly installed files (some of the old files may be the same).

Note To prevent the configuration files from being deleted when you uninstall the existing Command View SDM software to upgrade to a newer version, make sure the copies are in a location outside the Command View SDM installation path.

There are three configuration files that should be saved:

HP-UX and Linux

`/opt/sanmgr/commandview/server/config/`**PanConfigParams.txt**
`/opt/sanmgr/commandview/server/config/`**ContactInfo.txt**
`/opt/sanmgr/hostagent/config/`**access.dat**
`/opt/sanmgr/hostagent/config/`**commIpAddr.txt**

Windows

`\Program Files\Hewlett-Packard\sanmgr\commandview\server\config\`**PanConfig-Params.txt**
`\Program Files\Hewlett-Packard\sanmgr\commandview\server\config\`**ContactInfo.txt**
`\Program Files\Hewlett-Packard\sanmgr\hostagent\config\`**access.dat**

Windows - HP OpenView Storage Area Manager

`\Program Files\Hewlett-Packard\sanmgr\commandview\server\config\`**PanConfig-Params.txt**
`\Program Files\Hewlett-Packard\sanmgr\commandview\server\config\`**ContactInfo.txt**
`\Program Files\Hewlett-Packard\sanmgr\managementserver\config\`**authorizedClients.dat**

In addition, if you have downloaded any firmware update files stored within the Command View SDM installation path, and would like to save them, copy them to a temporary directory and restore after installation. Firmware file can

be identified by the .frm extension and are typically located in the `..\commandview\client\sbin` directory.

Should I Save the Host Port Behavior and Secure Manager Tables?

The host port behavior table and the Secure Manger table are maintained in the array and should not be impacted by the installation of a new version of Command View SDM. However, for added security you may want to consider saving copies of the LUN security table file and the host port behavior table file. If necessary, these files can be used to replicate or restore security and port behavior on the array.

Restoring Array Configuration Information

After Command View SDM has been installed on the host, the saved configuration can be restored as follows:

1. Replace files `access.dat` and `ContactInfo.txt` with the saved versions of the files.
2. Update the `PanConfigParams.txt` file using one of the following steps:
   a. If you have upgraded to a new version of Command View SDM, the newer version will include configuration settings that will be erased if you replace the new `PanConfigParams.txt` file with the older saved file. Instead, open both files in a text editor, identify any configuration settings you have changed in the saved file, update the new file with the changes., and save the updated file.
   b. If you are replicating the configuration on another host running the same version of Command View SDM, simply replace the existing `PanConfigParams.txt` with the saved version.
3. Restart HostAgent and OpenDIAL to invoke the new configuration. See "Starting/Stopping HostAgent and OpenDIAL" on page 67.

Configuring Command View SDM

Once installed, it may be necessary to configure the operation of Command View SDM. Configuration is required to perform the following tasks:

- Setting up remote client access
- Configuring the Command View SDM web browser
- Enabling EMS if necessary (HP-UX only)

Setting up Remote Client Access

When using a remote client to manage arrays, the client must be granted access rights by the Command View SDM host connected to the array. This includes clients running Command View SDM, and web browser clients. Access rights are managed using a special access file which is maintained on the Command View SDM host connected to the array. This file contains the IP addresses of clients that are allowed to manage any array connected to the host.

The following files are used to control client access:

- `access.dat` - standard installation
- `authorizedClients.dat` - HP OpenView Storage Area Manager (SAM) installation

Note By default the configuration file contains a value of "127.0.0.1". This localhost entry is required for Command View SDM host operation and must remain in the file.

1. On the Command View SDM host connected to the array, open the configuration file in a text editor. The file is located in the following directory:

   HP-UX and Linux: `/opt/sanmgr/hostagent/config/`
   Windows: `\sanmgr\hostagent\config\`
   HP OpenView SAM: `\sanmgr\managementserver\config\`

2. Add the IP address for each client requiring access to the arrays connected to the host. Single client IP addresses can be added, or a range of IP addresses can be added using the wild card "*". For example; 10.62.128.* grants access to any client on subnet 128. The use of

wildcards is recommended when connecting from clients configured for dynamic host configuration protocol (DHCP).

3 Save the configuration file.

Removing a Client

Use the above procedure to remove a host you no longer want to have access. When removing clients it is necessary to stop and restart the HostAgent to implement the change. See "Starting/Stopping HostAgent and OpenDIAL" on page 67.

Configuring the Command View SDM Web Server

The Command View SDM software includes its own web server, which is installed along with the other software components. By default, the web server is enabled on port 4096. If you need to disable the web server or change its port, you can do so using the following procedures.

Disabling the Web Server

By default, the Command View SDM web server is enabled to provide remote management capability. If remote access via the web is a security concern, the web server can be disabled.

1 On the Command View SDM host, open the web server configuration file, `PanConfigParams.txt`, in a text editor. The configuration file is located in the following directory:

HP-UX or Linux
`/opt/sanmgr/commandview/server/config/`

Windows
`<drive>:\sanmgr\commandview\server\config\`

2 Disable the web server by modifying the web server entry as follows:

```
WEBSERVER_ENABLED=false
```

Should you need to re-enable the web server, set the value to “true”.

Changing the Web Server Port

By default, the Command View SDM web server listens for http requests on port 4096. If this port is not available on your system, you can specify a different port. The port is specified in the following parameter in the configuration file `PanConfigParams.txt`:

```
WEBSERVER_PORT=4096
```

Change the value to an available port number.

Restarting the HostAgent Service

After making changes to the configuration `PanConfigParams.txt` file, you must stop and restart the HostAgent service on the server. For information on performing this operation, refer to "Starting/Stopping HostAgent and OpenDIAL" on page 67.

Note **HP OpenView SAM Implementation**
On HP OpenView SAM you must stop and restart the HP OpenView Storage Management Server service, not HostAgent. This is done from the Services dialog accessed from the Control Panel.

Enabling EMS Monitoring

If EMS monitoring is running on an HP-UX host when Command View SDM is installed, the array(s) will be automatically configured into the event monitoring. In this situation the following steps do not need to be performed.

It will be necessary to manually enable EMS if Command View SDM has been installed in the following environments:

- Command View SDM is installed on a Windows or Linux host that will be communicating with an HP-UX host running EMS.
- Command View SDM is installed on an HP-UX host that is not running EMS, but will be communicating with an HP-UX host that is running EMS.
- EMS monitoring is installed on an HP-UX host after Command View SDM has been installed.

To manually enable EMS, perform the following steps:

1. On an HP-UX host which is running EMS, perform the following steps. On all other hosts, go to step 2.
   a. Open the following file in a text editor:

   ```
   /var/stm/config/tools/monitor/RemoteMonitor.cfg
   ```

   b. Edit the entry for `DISK_ARRAY` to read as follows:

   ```
   DISK_ARRAY ENABLE
   ```

c Save the file.

d Continue with step 2.

2 Open the following file in a text editor:

```
/opt/sanmgr/commandview/server/config/PanConfigParams.txt
```

3 Edit the following entry to read as follows:

```
EMS_HOST=hostname
```

hostname is the name of the host running EMS

4 Save the file.

Setting the System Display Variable

When launching the GUI under HP-UX or Linux, the system environmental variable DISPLAY must be set to the system you are logged on to. In most cases, this variable is set by the system to the current system at logon. To verify this variable is set, type:

```
echo $DISPLAY
```

The response should be:

```
<your_current_system_alias>:0.0
```

If the DISPLAY variable is not set, the Command View SDM software will throw a Java exception. If this occurs, set the DISPLAY variable by typing:

```
export DISPLAY=<your_current_system_alias>:0.0
```

If you are remotely logging onto the system, you must give the Remote system access to your local system by typing on the local system prior to login:

```
xhost +<remote_system_alias>
```

If the alias of the remote system is not recognized by the local system, you may need to use the full remote system name or IP address.

Verifying the Installation

You can easily verify the success of the Command View SDM software installation using the following steps.

1. Perform a hardware scan from the host connected to the array to ensure that the host can see the array. On an HP-UX host, this is done using the `ioscan -fnkdisk` command.
2. From a command line on the host or client on which you have installed the software, enter the following command:

   `armdsp -i <hostname>`

   <hostname> identifies the remote host for which information will be displayed, and is required only when running the command on a client.
3. View the output displayed. It should include an entry similar to the following for each array connected to the host.

```
Serial Number:00SG04990114
Alias Name:blue
Device Path:/dev/rscsi/c30t7d0
World Wide Name:50060b00000921d0
Product ID:HP-A6188A
Unique ID:HPA6188A00SG04990114
```

Note If the anticipated output is not displayed, a problem may have occurred during installation. See "Solving Problems" on page 245 for help in isolating and solving the problem.

Starting/Stopping HostAgent and OpenDIAL

The HostAgent and OpenDIAL services (or daemons) are installed with Command View SDM. These services are started automatically during installation and any time the host is restarted. Both services must be running on the host for Command View SDM to operate. If these services are not running, they must be started manually. HostAgent and OpenDIAL are not needed on a remote Command View SDM client and can be stopped.

To start or stop HostAgent and OpenDIAL you must login as root or superuser (for HP-UX/Linux) or have Administrator Privileges (for Windows).

HP-UX and Linux

Individual scripts are used to start or stop both services.

- To stop HostAgent and OpenDIAL, enter the following command:

  ```
  /opt/sanmgr/commandview/client/sbin/HA_Dial_Stop
  ```

- To start HostAgent and OpenDIAL, enter the following command:

  ```
  /opt/sanmgr/commandview/client/sbin/HA_Dial_Start
  ```

Windows NT 4.0 and 2000

Note If Command View SDM is installed on an HP OpenView SAM management station, the HostAgent and OpenDial services are not used. The HP OpenView Storage Management Server service is used to integrate the Command View SDM software with Storage Area Manager. This is the service you must stop/start in this environment.

Although it is possible to start or stop HostAgent and OpenDIAL from the Services dialog, it is recommended that you use the script files described below. This will ensure that the services are stopped and started in the proper order.

- To stop HostAgent and OpenDIAL, enter the following from a command prompt:

  ```
  <drive>:\Program Files\Hewlett-Packard\sanmgr\command-
  view\client\sbin\HA_Dial_Stop
  ```

- To start HostAgent and OpenDIAL, enter the following from a command prompt:

  ```
  <drive>:\Program Files\Hewlett-Packard\sanmgr\command-
  view\client\sbin\HA_Dial_Start
  ```

Creating LUN 0

Many operating systems rely on the presence of LUN 0 to establish a communication path to all LUNs on the array. Consequently, it is recommended that the array always have LUN 0 present.

When LUN 0 is created, the array automatically creates an entry in the LUN security table granting Write & Configure access to all hosts. This entry ensures that all Command View SDM hosts will be able to manage the array. It is recommended that this entry not be deleted from the table.

Because all hosts will have access to LUN 0, you may want to limit its size (10 MB) and not use it to store any critical data.

Adding a New Host to the Management Configuration

When adding a new host to your system, you will need to take the necessary steps to ensure the host can access the array. There are two steps to perform:

1. If the host does not use the default controller host port behavior, the host will have to be added to the host port behavior table. See "Creating the Host Port Behavior Table" on page 146 for information on performing this task.
2. If LUN security is being used, the host will have to be granted access to the desired LUNs on the array. This is done by updating the LUN security table on the array. For information on managing LUN security, refer to the *HP StorageWorks Secure Manager User Guide* included with the Secure Manager Software Media Kit (T1003A).

Renaming a Host

If it becomes necessary to rename a host, the original host name must be removed from the host device database maintained by Command View. This is necessary to avoid the same arrays being displayed on the new host name and also on the old host name.

1. Run the following command to remove database entries for the existing host name:

   `armdiscover [managementhost] [-h hostname] -delete`

   Replace `hostname` with the current hostname. See "armdiscover" on page 123 for more information on using this command.

Note If the host has been renamed and added to the database before removing the original host name, the above command can also be used to remove the original host name entries. If this does not produce the desired results, it will be necessary to delete and rebuild the database as described in the following section.

2 When the host name has been changed and DNS is set up to correctly report the new hostname/IP address association, run the following command:

```
armdiscover [managementhost] [-h devicehost]
```

The armdiscover process will detect the new host name and add it and its associated arrays to the database.

Deleting and Rebuilding the Device Database

In some situations it may be necessary to delete and rebuild the device database. This may be necessary if the host has been renamed and added to the database before removing the original host.

1 Stop the HostAgent and OpenDial services as described in "Starting/ Stopping HostAgent and OpenDIAL" on page 67.

2 Delete or rename the current device database file (DeviceDBFile). The file is located in the following directories:

HP-UX or Linux

```
/opt/sanmgr/commandview/server/data/
```

Windows

```
<drive>:\sanmgr\commandview\server\data\
```

3 Restart the HostAgent and OpenDial services as described in "Starting/ Stopping HostAgent and OpenDIAL" on page 67.

4 Run the following command to rebuild the database:

```
armdiscover [managementhost] -h [devicehost]
```

Details About the Command View SDM Installation Process

This section describes in more detail the Command View SDM installation process. It is not essential that you read this material to install the software successfully. It is provided for those who have a desire to understand what is going on behind the scenes. It may also help you solve any problems that occur during the installation.

Command View SDM Architecture

Understanding the architecture of the Command View SDM software components should help you understand the installation and interaction of the various components.

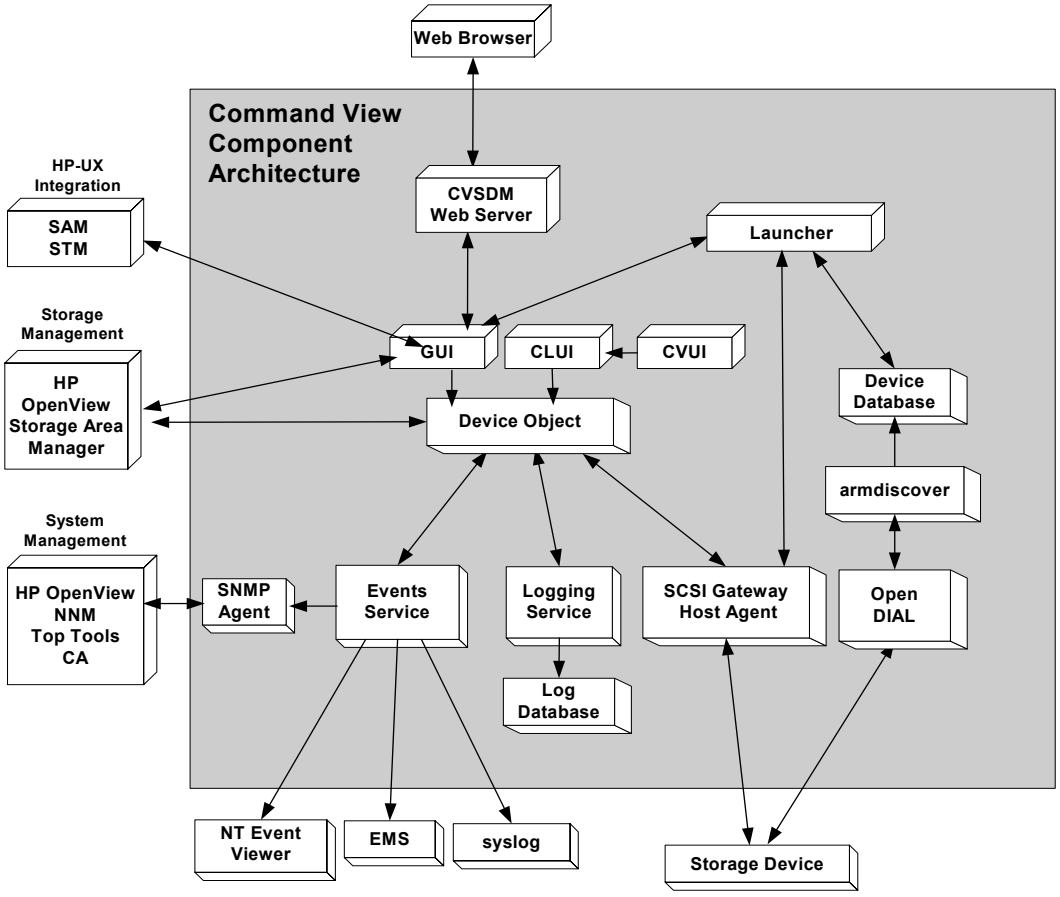
The major components is the Command View SDM software are shown in Figure 4. The integration with other components is also shown.

Command View SDM White Paper

A white paper describing the operation of Command View SDM in more detail can be downloaded from the following web site:

http://www.hp.com/products1/storage/products/disk_arrays/modular/commandview/infolibrary/index.html

Figure 4 Command View SDM Architecture



The Installation Process

The following steps identify the main tasks performed during the installation of the software.

1. The installer creates the directory structure on the host and copies the Command View SDM files to the appropriate folders.
2. The OpenDIAL and HostAgent services start, which in turn launch the server components - SCSI Gateway, Logging Service, etc.
3. The `armdiscover` process is initiated, which causes OpenDIAL to do a discovery of all arrays connected to the host.
4. The results of the discovery are stored in the device database files used by other components. The contents of the database files are used to populate the Launcher, and are returned in response to an `armdsp -i` command.
5. When all arrays are discovered, the logging service is enabled and it begins collecting log entries for the discovered arrays.
6. When the Launcher is run, it retrieves device information from the device data to determine what arrays are connected. The Launcher then accesses each array to determine its status and displays the appropriate icon for each array.

File Directory Structure

During the installation a directory structure is created on the host for the Command View SDM files. The main directory structure is listed below.

HP-UX and Linux Directories

The following directories are created when installing Command View SDM on an HP-UX or Linux host. Files are split between /opt/sanmgr, /etc/opt/sanmgr, and /var/opt/sanmgr

```
/opt/sanmgr
/opt/sanmgr/jre/bin
/opt/sanmgr/jre/lib
/opt/sanmgr/hostagent/sbin
/opt/sanmgr/hostagent/config > /etc/opt/sanmgr/hostagent/
config
/opt/sanmgr/hostagent/data > /var/opt/sanmgr/hostagent/
data
/opt/sanmgr/hostagent/log > /var/opt/sanmgr/hostagent/log
```

```
/opt/sanmgr/commandview/client/config
/opt/sanmgr/commandview/client/sbin
/opt/sanmgr/commandview/server/config > /etc/opt/sanmgr/
commandview/server/config
/opt/sanmgr/commandview/server/data > /var/opt/sanmgr/
commandview/server/data
/opt/sanmgr/commandview/server/logs > /var/opt/sanmgr/
commandview/server/logs
/opt/sanmgr/SMI-S/...
/opt/sanmgr/cssi/...
```

Windows Directories

The following directories are created when installing Command View SDM on a Windows host. Note that some directories differ when installing on an HP OpenView Storage Area Manager host.

```
\Program Files\Hewlett-Packard\sanmgr
\Program Files\Hewlett-Packard\sanmgr\jre\bin
\Program Files\Hewlett-Packard\sanmgr\jre\lib
\Program Files\Hewlett-Packard\sanmgr\commandview\client\config
\Program Files\Hewlett-Packard\sanmgr\commandview\client\sbin
\Program Files\Hewlett-Packard\sanmgr\commandview\server\config
\Program Files\Hewlett-Packard\sanmgr\commandview\server\data
\Program Files\Hewlett-Packard\sanmgr\commandview\server\logs
```

Standard Install with HostAgent and OpenDIAL

```
\Program Files\Hewlett-Packard\sanmgr\hostagent\sbin
\Program Files\Hewlett-Packard\sanmgr\hostagent\config
\Program Files\Hewlett-Packard\sanmgr\hostagent\data
\Program Files\Hewlett-Packard\sanmgr\hostagent\log
```

Install with HP OpenView Storage Area Manager (SAM)

```
\Program Files\Hewlett-Packard\sanmgr\managementserver\sbin
\Program Files\Hewlett-Packard\sanmgr\managementserver\config
\Program Files\Hewlett-Packard\sanmgr\managementserver\data
\Program Files\Hewlett-Packard\sanmgr\managementserver\logs
```

HP StorageWorks SMI-S VA (Storage Management Initiative Specification)

Introduction

HP StorageWorks SMI-S VA provides the Web-Based Enterprise Management (WBEM) interface for the management of HP StorageWorks VA arrays. SMI-S VA is a component of Command View SDM and runs as a service daemon. To start and stop SMI-S VA, see "SLP DAEMON Installer" later in this chapter.

This document section procedures for configuring and installing SMI-S VA for HP StorageWorks Command View SDM. SMI-S VA v1.02.02 supports Command View SDM 1.07 (minimum version). The recommended version is v1.07.

Supported Operating Systems

SMI-S VA v1.02.02 is supported on the following operating systems;

- HP-UX versions 11.0, 11.11, 11.23
- Windows 2K SP1 or above
- Windows NT SP6a or above
- Windows Server 2003 (32-bit)
- Red Hat Linux 7.1 (kernel 2.4.2)
- Red Hat Advanced Server 2.1

Installing SMI-S VA

HP StorageWorks SMI-S VA is installed automatically when the HP StorageWorks Command View SDM software is installed.

Starting and Stopping SMI-S VA

Windows

The display name of the service is hp StorageWorks SMI-S CIMOM

(Service Name hpSMISCIMOM). The service is stopped and started by selecting:

Control Panel > Administrative Tools > Services (for Windows 2000 and Server 2003)

Control Panel > Services (for Windows NT)

HP-UX and Linux

The name of SMI-S VA daemon is hpSMISCIMOM. The daemon can be started by running the script SMIS_trigger located in the /opt/sanmgr/ SMI-S/directory with the start option. The SMIS_trigger also supports restart of the service.

$ SMIS_trigger start

The daemon can be stopped by running the script SMIS_trigger with the stop

option.

$ SMIS_trigger stop

Configuring SMI-S VA

The set of configuration files you need to modify are:

- cim.properties: CIMOM related parameters for enabling SSL, JAAS, etc.
- VAProvider.hpcfg: The provider configuration parameters.
- Passwords: The user names and passwords for the authentication of the clients connecting to the CIMOM server.
- JAAS.policy: Used for configuring an access control list.

Configuration parameters appear in the sections below. After changing any of the configuration parameters, be sure to restart the hpSMISCIMOM service.

Table 1 cim.properties

Field	Purpose
EnableBasicAuthorization ("true" or "false")	Set this to "true" to indicate that you want the basic level of authentication and authorization.
EnableCompleteAuthorization ("true" or "false")	Set this to "true" to indicate that you want complete authentication and authorization. Each command needs to be authorized before it can be executed. If EnableCompleteAuthorization is set to "true," then the value of EnableBasicAuthorization is ignored.
EnableSSL ("true" or "false")	Set this to "true" to enable SSL

VAProvider.hpcfg

For Windows:

Location: <DriveLetter:\>Program Files\Hewlett-Packard\SMI-S\cimom\VAProvider.hpcfg

For HP-UX and Linux:

Location: /opt/sanmgr/SMI-S/VAProvider.hpcfg

VAProvider.hpcfg **Syntax:** <provider class>; <cycle wait time in seconds>;

<server host>; <event periodicity>; <Debug flag>; <NameSpace>; <cleanup

frequency>

The values of the parameters described in Table 2 should be configured before managing VA arrays using HP StorageWorks SMI-S VA. A restart of the VA provider service (hpSMISCIMOM) is required after modifying these Configuration parameters.

Table 2 Default Parameters

Field	Purpose	Modifiable
Provider Class	VA Provider class Name	No
Cycle wait time in seconds	Wait time between cycles to update persistence with CIM data.	Yes
Server host	IP address of the management host to contact for the array data. (default value is set to localhost).	Yes
Event Periodicity	Specifies the periodicity of the event capturing.	Yes
<Debug>	By default it is false. If true it writes log information into file. <Installation Directory>\HPVACimomDebug.log (Passive Management data such as details of CIM instance creation and deletion). <Installation Directory>\HPVAMethodLog.log (Active management data status of method providers by displaying Name of method invoked,Time it was invoked ,Status in terms of Succes or Failure along with description).	Yes
<NameSpace>	Currently only the root namespace is supported. A root namespace cannot be modified by a user.	No
<Cleanup frequency>	Describes how often CIM persistence data is cleared between the SMI-S VA cycles ,the unit is number of cycles of SMI-S VA	Yes

Passwords

This file has information about user names and corresponding passwords. The users are grouped and each group is assigned a set of permissions. To manage the user accounts format of the entries in the Passwords file:

Group:GroupName
User1:Password1
User2:Password2

Group:GroupNameA
UserA1:PasswordA1
UserA2:PasswordA2

Example:
Group name
Group:Administrator
Users/passwords under the group "Administrator"
Administrator:Administrator

Configuring JAAS

JAAS is used for better control over the operations which a user can perform. JAAS policy file (java.policy and JAAS.policy) is located in the installation directory and contains information about the permissions allocated to various user profiles.

JAAS Policy Entry Format:

grant [CodeBase ["URL"]],[Signedby ["signer"]],Principal [Principal_Class] ["Principal_Name"][, Principal ...]
{

Permission Permission_Class "Target_Name" [, "Action [,Action]"] [, signedBy "signer"];
...
};

There are various types of targets to which the permissions are allocated. Supported target

types are:

Class
Qualifier
Instance
Property
Method
Config

The target types use the following format:

target_type[:name_space[:class_name[:extended_name]]]

to narrow down the target to a sub-set of that type.

Actions can be associated with a particular target type. The supported actions are:

create
read
write
delete
execute
none

When loading the policy file, the syntax checker looks for the base target_type and the remaining extensions are not checked. The remaining extensions are based on the target type.

Class:namespace:classname
instance:namespace:classname
Quanlifiler:namespace:qualifierType
Property:namespace:classname:propertyname
Method:namespace:classname:methodname
Config

The more specific target-type overrides the generic target-type.

For example:

```
grant Principal com.hp.wbemjaas.HPPrincipal "administrator"
{
    Permission org.snia.wbemcmd.jaas.CIMPermission
    "instance:root:HPVA_StorageVolume", "write";
    Permission org.snia.wbemcmd.jaas.CIMPermission "instance" "read";
};
```

In the above example, the user with administrator profile privileges can read instances of all classes and can modify the instances of storage volume.

See the Passwords File section on page 10 for information on how to associate a user name to a particular user profile.

SLP DAEMON Installer

The SMI-S server supports Service Location Protocol Daemon (SLP) discovery and it is mandatory to have the "slpd" (SLP daemon) running on management host. The SLPD binaries are located on the web and the Command View SDM CD.

Binaries Location on the Web and CD

HP-UX

HP-UX Binaries Location on the Web

http://www.software.hp.com/cgi-bin/swdepot_parser.cgi/cgi/displayProductInfo.pl?productNumber=HPUXSLP

HP-UX 11.00 Binaries Location on the CD

The HP-UX 11.00 slpd binaries are located on the Command View CD as follows:

```
/CD Root/
|SMI-S/
        |slpd/
              |hpux/
                    |slpd-11.00.depot
```

HP-UX 11.11 Binaries Location on the CD

The HP-UX 11.11 slpd binaries are located on web and Command View CD as follows:

CD:

```
/CD Root/
|SMI-S/
        |slpd/
              |hpux/
                    |slpd-11.11.depot
```

HP-UX 11.23 Binaries Location on the CD

For HP-UX 11.23 slpd is bundled along with the Operating System.

Linux

Linux Red Hat Binaries Location on the Web

http://openslp.org/download.html (openslp-1.0.11-1.i386.rpm)

Red Hat Linux 7.1 and Red Hat Linux Advanced Server 2.1 Binaries Location on the CD

The Linux slpd binaries are located on the web and the Command View SDM CD as follows:

CD:

```
/CD Root/
|SMI-S/
        |slpd/
             |linux/
                  |slpd.rpm
```

Windows

Windows Binaries Location on the CD

The Windows slpd binaries are located on the Command View CD as follows:

```
/CD Root/slpd/windows/setup.exe
```

Solving Installation Problems

Problem	Solution
The server did not respond to the CIM requests and the CIM Clients receive "CIM_ERR_FAILED" exception.	Determine if the `hpSMISCIMOM` Service/daemon is running. If not, start the service. Determine if the TCP/IP Protocol stack is properly installed on the host. To check, ping localhost. If the ping fails, reinstall the TCP/IP Stack. Determine if TCP port 5988 is used by another process. If used, then server binds it self to the next free port, so client should try connecting to the next port number (e.g 5989).
The CIM calls are raising NullPointerException.	Check the available disk space on the drive where CIMOM server is installed. If it is full, clean up the disk to make more free space available. If the disk is not full, this indicates that the problem is with the CIM call. Determine if the parameters are valid.
The CIM query did not return any instances even when the host pointed by the parameter Host in the VAproviders.hpcfg configuration file had virtual arrays connected to it.	Determine if the `Hostagent` service is running on the host machine to which the arrays are connected. If the service is not running, start the `Hostagent` service and then restart the `hpSMISCIMOM` service.

Managing Passwords for VA LUN Security/ LUN Masking Access

The VA provides the capability to password-protect access to the LUN security management interface. The password is entered when the system is being configured and is maintained within the array.

When SMI-S interface is initially used to access a password-protected LUN security table on the array the user must enter the password using the "VA_LunMasking_PasswdUtility" described below. The password is stored in encrypted form on the management host (the system- where hpSMISCIMOM service/daemon is running) and subsequently used to establish all SMI-S management sessions. If the password is changed, it must be changed in the array. The new password must be re-entered using the VA_LunMasking_PasswdUtility.

Location of the utility:

HP-UX/ Linux

/opt/sanmgr/SMI-S/ VA_LunMasking_PasswdUtility.sh

Windows

<DriveLetter:\>Program Files\Hewlett-Packard\SMI-S\VAProvider\ VA_LunMasking_PasswdUtility.bat

The LunMasking password utility supports the following options:

1. **Add** - adds a new password for the array.
2. **Delete** - deletes a password for the array.
3. **Modify** - modifies a password for the array.
4. **List** - lists all the passwords in decrypted form along with array WWN's in the following format:

```
Array WWN          :     Passwd
-----------  -----     ------
50060B00000921EB:     stsdarray
```

5. **Exit** - exit the license utility.

Enter the number of the desired option to perform the operation. SMI-S VA interface allows the user to view & modify LunSecurity/LunMasking data for all the arrays that has a password entry on the management station. You can do add

and modify operation and modification does not require restarting the hpSMISCIMOM service/daemon.

Using the Graphical User Interface

3

The Command View SDM Graphical User Interface (GUI) provides a convenient and familiar interface for managing the array. Using the GUI you can perform most of the tasks involved in the normal day-to-day operation and management of the array. For tasks not available in the GUI, the Command Line User Interface (CLUI) should be used.

This chapter describes how to start the GUI and use it to perform common management tasks.

Note Use of the Command View SDM GUI through a firewall is not supported.

The GUI Components

The GUI comprises two components:

- **Launcher** - displays all the arrays connected to the host. The Launcher builds the display based on information stored in device database files on the host. The Launcher accesses each array to determine its status, which is also displayed. Double clicking on an array icon runs the management GUI for that array.
- **Management GUI** - the interface from which you perform direct management of a specific array. Multiple instances of the GUI can be running on the host, allowing you to manage multiple arrays simultaneously.

Running the Command View SDM GUI

There are several methods for running the Command View SDM GUI, each of which is described here.

Note

Accessing the array from a remote client requires the proper access

Regardless of the method you use to start the GUI, a remote client will need the proper access rights to manage an array. See "Setting up Remote Client Access" on page 62 for more information.

Watch Your Case

On an HP-UX system, case is important. The Launcher and cmdviewVA must be entered with an upper case L and VA, respectively. For example:

```
http://<hostname>:4096/Launcher.html
http://<hostname>:4096/cmdviewVA.html?<hostname>:<array-id>
```

User Security

The Command View SDM software enables you to set user level security.

Enabling User Security

Security is enabled via the \sanmgr\commandview\server\config\PanConfigParams.txt entry SECURITY_ENABLED. Setting the value to =true will enable security, setting =false will disable security. When security is enabled, the user will be explicitly prompted with a login screen over a remote or local host.

Note Security is not checked over the serial port.

Configuring User Security

Security can be easily configured using the Launcher. You can also use the secadmin command to configure security (see secadmin in the CLUI chapter).

Default User Name and Password

After installation, there are no users in the security database and the default username is “Administrator” and the default password is “administrator” (note - case sensitive).

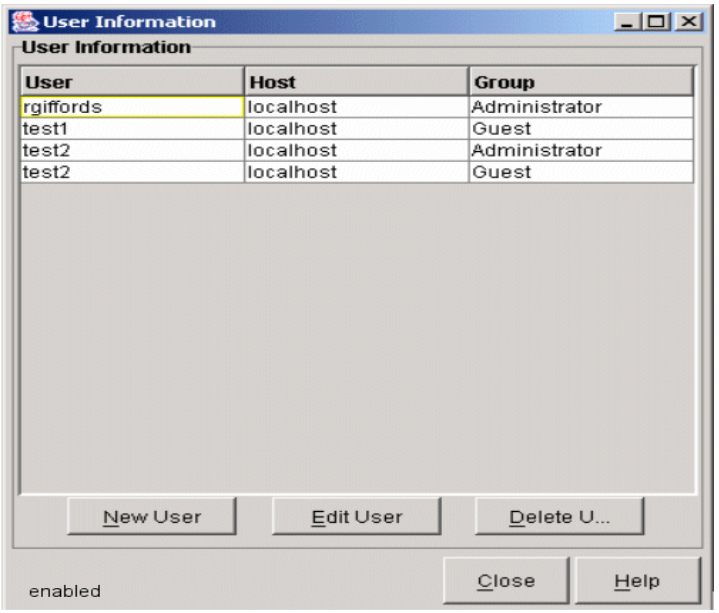
Important! You will need to add at least one new user (and password) to the security database that is a member of the Administrators Group. You will not be allowed to leave the Launcher security screen (or exit the secadmin command) until this requirement is met. This is because a valid member of the Administrators Group is required for later access to the security configuration module and only Administrators may access this module.

Configuring User Security Using the Launcher

When you start the Launcher, an **Administration Validation** dialog will appear before allowing security configuration. Enter a valid Username and Password for the host. The **User Information** dialog will appear.

User Information Dialog

This dialog displays: users, the host the user is allowed to connect to the array from, and the group to which the user is a member. The dialog allows adding new users, editing parameters for existing users, and deleting existing users.



The User Information dialog displays a table showing:

- Users - Valid users
- Hosts - Hosts that can be to the array
- Group - The groups to which the users belong

The current security setting is indicated in the lower left corner of the screen. If the array can not connect to the server, a security setting of "unknown" is displayed otherwise, "enabled" or "disabled" is displayed.

Clicking the **New User** button displays a dialog to allow adding new users to the table. To enter a new user, enter a valid: username, password, confirmation password, and group (from Groups). Multiple groups may be entered, however, multiple entries will be displayed in the dialog. An error dialog is displayed if the proper information is not entered. Clicking the **OK** button saves the entries in the user database and clears the dialog. Clicking the **Exit** button exits the dialog (without saving pending entries). Clicking the **Clear** button, clears all entries. Clicking the **Help** button calls the help for the dialog.

Clicking the **Edit User** button displays a dialog (see page 92) that allows editing of the user's password information. A new password must be entered

and confirmed in the Confirm Password text box. Clicking the **OK** button saves the new password (and closes the dialog). An error dialog is displayed if incorrect entries are made.

Clicking the **Delete User** button displays a dialog that allows deleting of users from the table. Clicking the **Yes** button will delete the selected user. Clicking the No button will close the dialog and return to the User Information dialog.

Note **Important!** At least one user must be a member of the Administration Group to exit the configuration setup (a warning message will be displayed indicating this). (see 89)

Group and User Names

When the command view software is initially installed, two groups exist: Administrator and Guest. Members of the Administrator Group have access to all commands, and members of the Guest Group do no have access to the array security features. You can create Groups and add members to your groups to more easily perform array adminsitration Group and User Names

Regardless of what group a user is in, all users are allowed access to all other CLUI commands (only users in the Administrator group are allowed to administer the security database and use the secadmin command).

Security Over a Network

When you are using security over a network, the security module will attempt to resolve the hostname/IP address to a fully qualified name. If the network resolves the hostname/IP address to a fully qualified name, then this must be used as the hostname (i.e. myhost.boi.hp.com). If the network does not resolve the hostname to a fully qualified name, then only the hostname (without the domain) must be entered into the security database.

Valid Characters

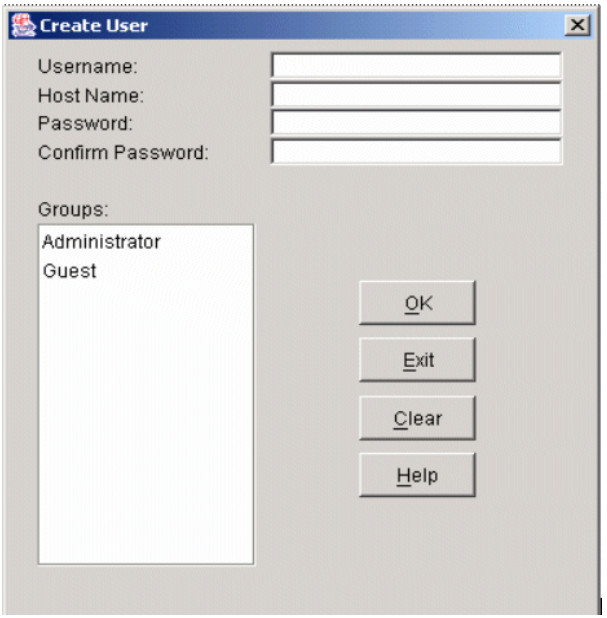
Username, hostname, and group can not include the pipe character (|) and none of the fields, username, hostname, group, or passwords can include control characters (non-printable).

New User Dialog

Clicking the **New User** button displays a dialog that allows you to add a user to the security of the array. A valid: Username, Password and Confirm Password must be entered (the Password and Confirm Password must be identical). The Host Name entry is optional and if left blank, will default to the "localhost."

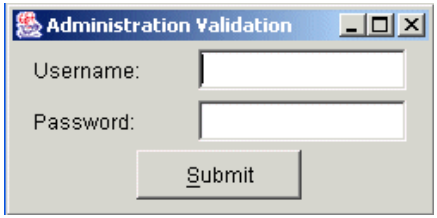
At least one group must be selected from the Groups list. Multiple groups may be selected for a user (this will result in multiple users appearing each group in the User Information table (see page 89).

Pressing the **OK** button enters the values into the user database (and clears the dialog of entries). Pressing the **Clear** button clear the dialog of entries (but leaves the dialog open). Pressing the **Exit** button exits the dialog without saving any values.



Login Screen

When an array is selected from the launcher (via a local or remote host) a Administration Validation login dialog is displayed. A valid Username and Password must be entered to administer the array.



Running the Launcher from the Windows Icon

During installation on a Windows host, a Command View SDM Launcher icon is placed on the desktop. You can start the GUI from this icon.

1. Double click the Launcher icon.

   The Command View SDM Launcher window opens displaying an icon for each array connected to the host. The icon indicates the current array status.

2. Double click on an array icon to run the management GUI for the array. You can now begin managing the array.

Running the Launcher Using a Command Line

On HP-UX and Linux systems, the Launcher is run from the command line.

1. Start the Launcher by entering:

   `launcher` **<<From the local host**

   `launcher <hostname>` **<<From a remote client**

   `<hostname>` is the name of the host to which the array is connected

Note If the host cannot find the Launcher, add the path to the command as follows:

HP-UX or Linux

```
/opt/sanmgr/commandview/client/sbin/launcher <hostname>
```

Windows

```
<drive>:\Program Files\Hewlett-Packard\sanmgr\command-
view\client\sbin\launcher <hostname>
```

2 To start the management GUI, double click on any array icon displayed in the Launcher window.

Running the Management GUI Directly from a Command Line

You can bypass the Launcher and run the management GUI for a specific array. You must know the ID of the array you want to manage to use this technique. To run the GUI directly from a command line, enter the following command:

```
cmdviewVA <array-id>
```
<<From the local host

```
cmdviewVA <hostname:><array-id>
```
<<From a remote client

`<hostname>` is the name of the host to which the array is connected.

`<array-id>` is the array's alias, serial number, device file, or world wide name.

Running the Launcher from a Web Browser

The Command View SDM Launcher and management GUI can be run from a web browser. This provides a convenient method of managing an array from a remote client that does not have the Command View SDM software installed.

Note Earlier versions of Command View SDM (1.0 and 1.01) required the installation of a certificate on the browser client for security. Later versions of Command View SDM (1.02 and later) no longer require the installation of the certificate. The applets are now authenticated with built-in certificates.

1 Open a browser on the client.

2 Type the following URL into the address field in the browser:

```
http://<hostname>:4096/Launcher.html
```

`<hostname>` is the name of the Command View SDM host to which the array is connected.

Note The Sun Java 1.3.1 plug-in is required to run Command View SDM. If this component is not installed, you will be prompted to install it at this point. Follow the instructions to install the Java plug-in, and then continue with the next step.

On an HP-UX host you will need to go to the following web site to get the necessary Java plug-in components:

http://www.hp.com/products1/unix/java

3. If the Java Plug-in Security Warning is displayed, select Grant Always to avoid having the warning displayed again. If you select Grant This Session, the message is displayed for each signed jar file that is initially loaded in this session.
4. When the Launcher window is displayed, double-click an array icon to start the management GUI.

Running the Management GUI Directly from a Web Browser

If you know the ID of the specific array you want to manage, you can run the management GUI directly from the browser.

1. Open a browser on the client.
2. Type the following URL into the address field in the browser:

   `http://<hostname>:4096/cmdviewVA.html?<hostname>:<array-id>`

   `<hostname>` is the DNS name or IP address of the host to which the array is connected.

   `<array-id>` is the array's alias, serial number, device file, or world wide name.

Running the Management GUI from an OpenView SAM Management Station

In an OpenView SAM environment, the management GUI should be run from the SAM screen. Although the Launcher is installed, it should not be used to run the GUI.

To run the management GUI,

Using the Command View SDM GUI

You perform array management tasks using the GUI by selecting the appropriate tabs and pages. For detailed information on using the GUI, access the on-line help by clicking the "**?**" located in the upper right corner of the screen.

Locating Information

The GUI interface uses a set of tabs to organize the tasks and information presented. The following table should assist you in determining which tab to use to perform a task.

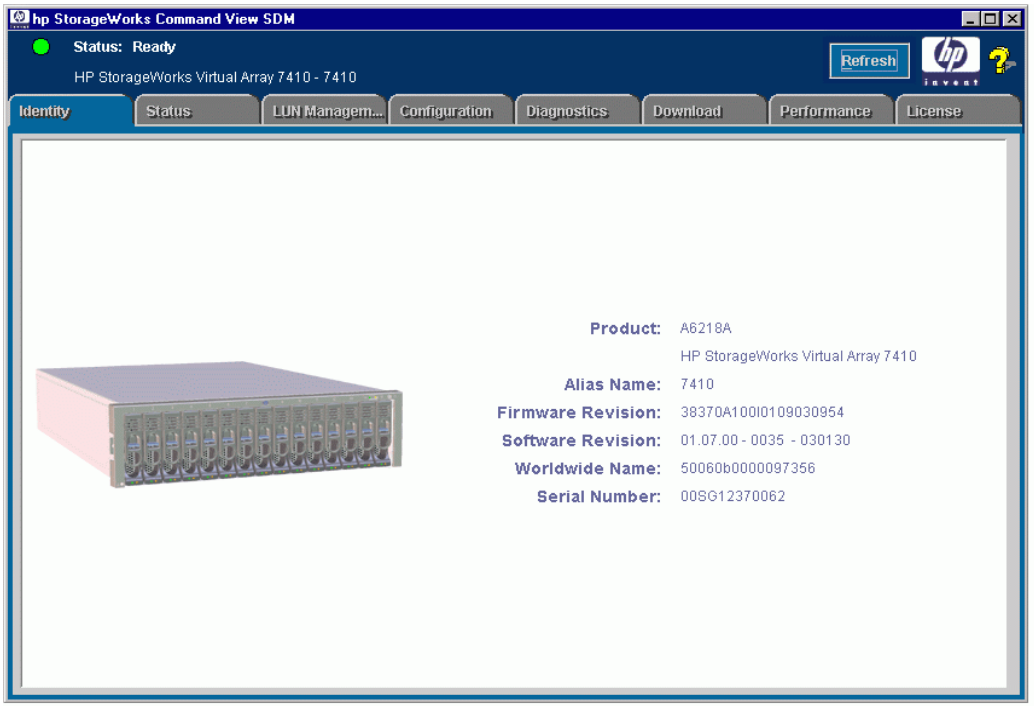


Table 3 GUI Navigation Overview

Tab	Task/Information
Identity	Displays general information about the array.
Status	Status information is organized into three categories: — Array Status - general array status — Component Status - complete status information for each hardware enclosure in the array. Select the appropriate enclosure icon to display its status. — Capacity - a graphical representation of how the array capacity is allocated
LUN Management	LUN Management tasks are organized into three categories: ■ Logical LUNs - these management tasks include: — Creating a LUN — Deleting a LUN — Creating a copy of a LUN ■ Secure Manager - these management tasks include: — Enabling/disable Secure Manager — Adding, deleting, and editing Secure Manager table entries — Copying permissions from one LUN to another — Changing the Secure Manager password — Reading and updating the Secure Manager table on the array ■ Business Copies - these management tasks include: — Creating a business copy LUN — Deleting a business copy LUN — Copying data from a parent LUN to a business copy LUN — Copying data from a business copy LUN to a parent LUN — Emptying the data from a business copy LUN

Table 3 GUI Navigation Overview (Continued)

Tab	Task/Information
Configuration	Configuration settings and displays are organized into three categories: ■ Array Settings — Alias name — Data resiliency — RAID level — Hot spare mode — Automatic include — Auto format ■ Port Settings — Port ID — Port behavior — Port topology — Port data rate — Queue Full Threshold ■ Rebuild Settings — Priority — Type - auto/manual — Initiate rebuild — Progress indication ■ Host Port Behavior Table — Read table from array — Add table entries — Write table to array — Delete or WWN — Edit entry

Table 3 GUI Navigation Overview (Continued)

Tab	Task/Information
Diagnostic	Diagnostic tasks are organized into two categories: ■ Array — Shutdown/Restart — Reset - full or partial — Array status ■ Disk — Include — Down — Disk status
Download	Firmware can be downloaded to the array controllers, the disk enclosure controllers (LCCs), disks, and the batteries. The download tasks include: — Copying firmware from one controller to the other — On-line download — Off-line download
Performance	The performance tasks include: — Selecting metrics for display — Customizing the display — Exporting performance data
License	Display information for the following license categories: — Array License - status and license information for Secure Manager and Business Copy — Software License - License information for Command View SDM

Performing Management Tasks from the GUI

The following section describes how to use the GUI to perform some of the common tasks involved in the day-to-day management of the array. This is not a complete list of the management tasks available in the GUI. For a complete list of the GUI functionality, see Table 3.

These, and all other tasks available from the GUI, are described in the on-line help. The on-line help should be your primary source of information when using the GUI to manage the array.

Checking Array Status

1. Click the Status tab.
2. Click the Array Status button to display overall array information

   Click the Component Status button to display status information on components within the array.

Managing Array Capacity

Displaying Capacity Status

1. Click the Status tab.
2. Click the Capacity button to display a graph representing the current allocation of the array capacity.

Creating a LUN

1. Click the LUN Management tab.
2. Click the Logical LUNs button.
3. Click the Create LUN... button.
4. In the dialog that appears, enter the parameters for the LUN.
5. Click OK.

Deleting a LUN

Caution Deleting a LUN destroys all data on the selected LUN. Make sure any important data is backed up before proceeding.

Note If the LUN being deleted is very large, the time required to delete the LUN may cause host I/O timeouts.

1. Click the LUN Management tab.
2. Click the Logical LUNs button.
3. Click the LUN you want to remove in the LUN list. Note that you cannot remove LUN 0 using the GUI.
4. Click the Delete button.
5. Click OK in the dialog box that appears to delete the LUN.

Creating a Business Copy LUN

1. Click the LUN Management tab.
2. Click the Business Copy button.
3. Click the Create button.
4. In the dialog that appears, enter a LUN number and a parent LUN.
5. Click OK.

Deleting a Business Copy LUN

1. Click the LUN Management tab.
2. Click the Business Copy button.
3. Click the LUN you want to remove in the LUN list.
4. Click the Delete button.
5. Click OK in the dialog box that appears to delete the LUN.

Setting Active Hot Spare Operation

1. Click the Configuration tab.
2. Click the General Settings button.
3. Click the Array Settings... button.
4. Select the Hot Spare Mode.

5 Click OK.

Using Secure Manager

The Secure Manager screen is accessed as follows:

1 Click the LUN Management tab.

2 Click the Secure Manager button. Enter the password if necessary.

Enabling and Disabling Secure Manager

1 On the Secure Manager screen, click the Enable/Disable SM button.

2 Select Enable or Disable. Enter the password.

3 Click OK.

Refer to the GUI help for additional information about enabling or disabling security.

Changing the Password

1 On the Secure Manager screen, click the Change Password button.

2 Enter the old password and the new password.

3 Click OK.

The new password will take effect immediately.

Adding a DEFAULT Table Entry

1 On the Secure Manager screen, click the Add Table Entries button.

2 In the Participant Type field, select DEFAULT.

3 In the LUNs field, select the LUN or LUNs to which the entry will apply.

4 In the Permissions field, select the appropriate permission.

5 Click OK.

A DEFAULT entry will made in the table for each LUN you selected.

Adding a NodeWWN Table Entry

1 On the Secure Manager screen, click the Add Table Entries button.

2 In the Participant Type field, select Node WWN.

3 In the Host Name field, select the host or hosts for which you want to create table entries.

The World Wide Name field will display all the WWNs associated with the hosts you select. Host names are provided for convenience in displaying and selecting WWNs. The host name is not included as part of the table entry.

4 In the World Wide Name field, select the WWNs for which you want to create table entries.

5 In the LUNs field, select the LUN or LUNs to which the entries will apply.

6 In the Permissions field, select the appropriate permission. The permission will be applied to all entries.

7 Click OK.

The table is updated with an entry for each WWN/LUN combination selected.

Adding New Hosts

1 On the Secure Manager screen, click the Add Table Entries button.

2 Click the Add New Host button.

3 Enter the host name in the Host Name field.

4 Click OK.

Adding New World Wide Names

1 On the Secure Manager screen, click the Add Table Entries button.

2 Click the Add New WWN button.

3 Enter the world wide name in the WWN field.

4 Click OK.

Deleting Table Entries

1 On the Secure Manager screen, select the table entries you want to delete. Multiple entries can be selected.

2 Click the Delete Entry button.

3 Click OK.

Copying LUN Permissions

1. On the Secure Manager screen, click the Copy Permissions button.
2. Enter the number of the LUN from which permissions will be copied.
3. Enter the number of the LUN to which permissions will be copied.
4. Click OK.

   Each table entry for the source LUN is duplicated for the new LUN.

Writing the Secure Manager Table to the Array

1. On the Secure Manager screen, click the Write Table button.
2. Select the desired write mode: Append or Clear
3. Click OK.

Managing Host Port Behavior Table

The host port behavior table management screen is accessed as follows:

1. Click the Configuration tab.
2. Click the Host Port Behavior button.

Reading the Host Port Behavior Table from the Array

1. On the Host Port Behavior screen, click the Read Table button.
2. Click OK.

Adding New Hosts

1. On the Host Port Behavior screen, click the Add Entries... button.
2. Click the Add New Host button.
3. Enter the host name in the Host Name field.
4. Click OK.

Adding New World Wide Names

1. On the Host Port Behavior screen, click the Add Entries... button.
2. Click the Add New WWN button.
3. Enter the world wide name in the WWN field.

4 Click OK.

Deleting Host Port Behavior Table Entries

1 On the Host Port Behavior screen, select the table entries you want to delete. Multiple entries can be selected.

2 Click the Delete Entry button.

3 Click OK.

Writing the Host Port Behavior Table to the Array

1 On the Host Port Behavior screen, click the Apply Changes... button.

2 Select the desired write mode: Append or Clear

3 Click OK.

Adding Table Entries from a File

1 On the Host Port Behavior screen, click the Load File... button.

2 Select the file containing the table entries and click Open.

Saving the Table Entries to a File

1 On the Host Port Behavior screen, click the Save To File... button.

2 Select the directory and file name for the table entries file and click Open.

Command Line User Interface

4

The Command View SDM Command Line User Interface (CLUI) is a set of utilities that provide complete array management capability. Each utility performs a different management task, such as configuring, reporting status information, and performing rebuilds. The operation of the CLUI is identical for all supported operating systems.

Some of the benefits the CLUI offers over the GUI include:

- **Full functionality** - the CLUI provides access to all array management tasks, including tasks that are not available in the GUI.
- **Simplify management tasks with scripts** - the CLUI can be used in creating custom scripts for efficient array management in a SAN environment. This technique is effective in quickly configuring a set of arrays in a network management application environment.
- **Easy remote access** - the CLUI can also be used to remotely manage the arrays by using the telnet application to log into the host system.

Command Summary

Each command and the tasks it is used for are listed in Table 4. Complete descriptions for each command are included in this chapter.

Table 4 Command View SDM Command Summary

Command	Tasks
armcfg	Create a LUN Delete a LUN Add a disk Down a disk
armcopy	Manage Business Copy LUNs
armdiag	Perform advanced troubleshooting.
armdiscover	Discover all arrays connected to the host
armdownload	Download firmware Display firmware revisions Copy firmware
armdsp	Display status information List array IDs
armfeature	Install feature licenses
armfmt	Format the array
armhost	Manage host port behavior table
armlog	View array logs

Table 4 Command View SDM Command Summary (Continued)

Command	Tasks
armmgr	Configure hot spares Set array RAID level Set Auto Rebuild On/Off Set Auto Format On/Off Set Auto Include On/Off Set controller host port behavior Set resiliency level Set port loop ID Set fibre channel topology Break advisory lock Set array alias name Identify FRU location Reset the array Manage read and write cache settings Shutdown the array Set Queue Full Threshold
armperf	Display performance data
armrbld	Enable/disable Auto Rebuild Display rebuild status/progress Set rebuild priority
armrecover	Manage map recovery
armsecure	Manage LUN security table
armshell	Open multi-command environment
armtopology	Display host and LUN information
licApp**	Display license information
licUtil**	Install, remove, and modify license information
logprn*	Outputs log file information
logdel*	Deletes log files
secadmin	Manage array security
* These command are discussed in "Array Logs" on page 221 ** These commands are discussed in "Array Licenses" on page 235	

Command Syntax Conventions

The following symbols are used in the command descriptions and examples in this chapter.

Table 5 Syntax Conventions

Symbol	Meaning
< >	Indicates a variable that must be entered by the user.
|	Only one of the listed parameters can be used (exclusive OR).
[ ]	Values enclosed in these brackets are optional.
{ }	Values enclosed in these braces are required.

Command View SDM man pages

Online man pages are included for each Command View SDM command. Each man page includes detailed information about the command and its usage.

To display the man page for any Command View SDM command, type:

```
man <command_name>
```

Substitute one of the Command View SDM utility names for `command_name`. For example, to display the armdsp man page, type:

```
man armdsp
```

Quick Help

A quick listing of the syntax and available options for a command can be displayed by using the "?" option with the command. For example, for quick information about the armmgr command, type:

```
armmgr -?
```

Using Identification Variables

When using the Command View SDM CLUI, you must select the array you will be managing. In addition, many commands also require you to identify the component within the array — controller, disk, or LUN — that will be impacted by the command.

The following paragraphs describe the identification variables and how they are used in a command. Before using the command, make sure you understand the use and structure of the identification variables. A lack of understanding may result in commands executed on an unintended component.

Array Identifier

The array identifier specifies the array to which a command is directed. It has the formats:

<array-id> **<<From the local host**
<HostName:array-id> **<<From a remote client**

HostName can be the IP address or DNS name of the host. On OpenView SAM, all arrays are considered local and HostName is not required.

The four values listed in Table 6 can be used as the array identifier.

Table 6 Array Identifier Values

Value	Description
Array serial number	The unique serial number assigned to the array
Alias name	The alias name assigned to the array
Device file	The path to the array. The syntax is dependent on the operating system. For example, a device file can be /dev/dsk/c2t0d0 on HP-UX or \.\PHYSICALDISK1 on Windows.
World wide name (WWN)	The Fibre Channel WWN assigned to the host or one its adapters. Either the port or node WWN can be used.

Note **How can I determine the array serial number or alias?**
Use the `armdsp -i` command to display a list of the arrays, including their serial numbers and aliases.

FRU Identifiers

All the Field Replaceable Units (FRUs) within the array are identified using a FRU location identifier, <FRULocation>. The FRU location identifier specifies the component to which a command is directed. It has the format:

```
<enclosure>/[component].[subcomponent]
```

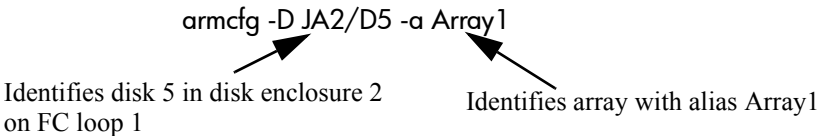
The values for the elements of the FRU location identifier are listed in Table 7.

Table 7 FRU Location Identifier Values

Element	Values
<enclosure>	**M**: main array enclosure **JA0 - JA5**: Disk enclosures 0 through 5 on back-end FC loop 1. The number corresponds to switch setting on the disk enclosure. On the VA 7400/7110, all disk enclosures are on loop 1. **JB0 - JB5**: Disk enclosures 0 through 5 on back-end FC loop 2. The number corresponds to switch setting on the disk enclosure. Only the VA 7410 has a FC loop 2.
<component>	**D1 - D15:** disk modules in slots 1 through 15 **C1 - C2**: controller/LCC modules in slots* 1 or 2 **P1 - P2**: power supply/fan modules in slots* 1 or 2 **MP1**: midplane assembly
<subcomponent>	**B1**: battery located on controller **M1**: DIMM in socket 1 **H1 - H2**: host ports 1 and 2 (port 2 on VA 7410 only) **J1 - J2**: Disk enclosure ports 1 and 2 (port 2 on VA 7410 only) **PM1**: processer **G1 - G2**: GBIC in slot 1or 2
* 1 is the left slot; 2 is the right slot, as viewed from the rear of the array	

Example

The following command identifies the disk in slot 5 of disk enclosure 2 on FC loop 1 on the array identified by alias Array1.


armcfg -D JA2/D5 -a Array1
Identifies disk 5 in disk enclosure 2 on FC loop 1
Identifies array with alias Array1

Command View SDM Commands

This section describes each Command View SDM command, its use, and its options. Examples are included showing the typical use of the command.

armcfg

Description

The `armcfg` command is used to manage LUNs (-L option) and physical disks (-D option). LUN management includes creating and deleting LUNs. Disk management involves adding, downing, and resetting disks.

Caution Deleting a LUN will delete all data on the LUN. Backup all vital data on the LUN before deleting it.

Note If the LUN being deleted is very large, the time required to delete the LUN may cause host I/O timeouts.

Syntax

armcfg {-D <*FRULocation*> { -a | -d [-v | -F] [-R | -Z] | -r { true|false }} <*array-id*>

armcfg {-L <*LUN*> { -a <*capacity*> -g <group> | -d | -x { true|false }}} <*array-id*>

armcfg -?

Options

LUN Options (armcfg -L)

-L <*LUN*>	Operation will be performed on the LUN number identified by <*LUN*>
-a <*capacity*>	Create a LUN if -L is specified of the size specified by <*capacity*> or create a disk if - D is specified. If <*capacity*> is followed by "G" <*capacity*> is in Gigabytes. If <*capacity*> is followed by "K" <*capacity*> is in Kilobytes. If <*capacity*> is followed by "M" <*capacity*> is in Megabytes. If no unit is specified, the default unit is in Megabytes. The VA 7100 (with firmware version HP11 or greater) and the VA 7400/7410/7110 support up to 1024 LUNs (0-1023).
-d	Delete the specified LUN.
-g <group>	Identifies the redundancy group the LUN will be created in. On the VA 7400/ 7410, <group> can be either 1 or 2. On the VA 7100/7110 this value must be 1.

-x { true | false }	Activates (true) or deactivates (false) the specified LUN. Performance can be improved by deactivating any LUN you will not be using.

Disk Options (armcfg -D)

-D <*FRULocation*>	Operation will be performed on the disk specified in <*FRULocation*>
-a	Add the disk specified by <*FRULocation*>.
-d [-v | -F] [-R | -Z]	Down the specified disk. The following options control the downing operation. By default, the controller assumes that no valid data remains on the disk when it is reinserted. The following options control behavior when the disk is reinserted. -v **-** On reinsertion of the disk, the controller assumes disk data is valid except for data written to the array since the disk was removed. -F **-** The array will auto fail the disk specified by <*FRULocation*>. By default, a down command will succeed only if downing of the disk does not result in a loss of redundancy or data availability. This can be overridden with the following options: -R - Allow the disk to be downed if doing so would result in a loss of redundancy but *not* data loss. Following this command the array will offer full data availability but will be unable to protect against any subsequent disk failure(s). -Z - Allow the disk to be downed even in the case where data will become unavailable. Caution should be exercised when using this option since data on the array may be lost.
-r { true | false }	Reset the specified disk using the indicated process. If "true", a Loop Initialization reset L_port loop primitive is used to reset the device If "false", a Target Reset Task Management function is used to reset the device.
-?	Display extended help message. This option overrides all other switches.

Examples

Creating LUNs

To create a LUN numbered 17 with a capacity of 30 Mbytes associated with redundancy group 2, for an array with the alias of myArray, type the following command:

```
armcfg -L 17 -a 30 -g 2 myArray
```

Deleting LUNs

To delete LUN 17 in the array with the alias of myArray, type the following command:

```
armcfg -L 17 -d myArray
```

Adding Disks

After a disk is inserted into the array, it must be added to the array configuration. If auto-include and autoformat are enabled, the disk will be automatically added. If these options are disabled, you will need to manually add a disk. To add a disk that has just been installed in disk enclosure 2 on FC loop 1, slot 5, type the following command:

```
armcfg -D JA2/D5 -a myArray
```

armcopy

Description

The `armcopy` command manages the business copy feature of the array.

Syntax

armcopy -p <*LUN*> -s <*LUN*> [-a { true | false }] <*array-id*>

armcopy -s <*LUN*> { -x { true | false} | -a { true | false } } <*array-id*>

armcopy -r <*LUN*> <*array-id*>

armcopy -?

Options

-a {true|false}	Controls the content of the busines copy. When used with both the -p and -s options, a value of true creates a business copy with content linked to the parent LUN data. A value of false creates an empty business copy LUN. The business copy will be allocated with the same capacity as the parent, but the content of the business copy will not be linked to the parent LUN data. If this option is not included, the default will be set to true. When used with the –s option only, a true value copies data from the parent LUN to the business copy. A false value empties the business copy.
-p <*LUN*>	Identifies the parent LUN to be copied. The LUN must exist and it may not be a business copy.
-r <*LUN*>	Copies the data on the business copy LUN back to the parent LUN. This option will work only if there is a single business copy of the LUN. If there are multiple business copies of the LUN, this command will fail.
-s <*LUN*>	Identifies the LUN to be assigned or is assigned to the business copy.
-x { true | false }	Activates (true) or deactivates (false) the specified business copy LUN. Deactivating a LUN does not make the LUN data inaccessible. It indicates that the LUN is less likely to be accessed than other, active, LUNs. This helps the array to determine how best to manage its resources.

-?	Display extended help message. Overrides all other switches.

Examples

Create an empty business copy LUN 7 from parent LUN 3 on array serial number 00USP1001087.

```
armcopy -p 3 -s 7 -a false 00USP1001087
```

Copy the content of the parent LUN to business copy LUN 4 on array alias Array1.

```
armcopy -s 4 -a true Array1
```

Copy the content of the business copy LUN to parent LUN 6 on array alias Array1.

```
armcopy -r 6 Array1
```

armdiag

Description

The `armdiag` command provides advanced diagnostic capability for isolating problems with the array.

Caution The functionality available using the `armdiag` command can damage the array and cause data loss if not used properly. In addition, the *Virtual Array SCSI Specification* is required to use this command. Contact HP support for assistance before using `armdiag`.

Syntax

armdiag -C {-c <cdb> | -cf <*filename*>} -dir <*direction*> -p <*password*> [-d <data> | -df <*filename*>] [-sf <*filename*>] [-b <*buffer_size*>] [-i <*iteration*>] <*array_id*>

armdiag -P -f <*FRULocation*> {-c <cdb> | -cf <*filename*>} -dir <*direction*> -p <*password*> [-d <data> | -df <*filename*>] [-sf <*filename*>] [-b <*buffer_size*>] [-i <*iterations*>] <*array_id*>

armdiag -I [-if <*filename*>] [-q] <*array_id*>

armdiag -W <*array_id*>

armdiag -Core [-Cf *filename*] <*array_id*>

armdiag -?

Options

-b <*buffer_size*>	An integer value that limits the size of the data coming back from the array. If not specified, the buffer size defaults to 1024 bytes.
-c <*cdb*>	The SCSI command descriptor block (CDB). The CDB is specified in hex values (e.g. 0xa0) and defines the operation the array will perform.
-C	Sends a generic SCSI pass-through command to the array controller. If one controller does not respond, the other controller will be tried.
-Core	Get the core file from the array. The core data (~48 MB) must be returned to the HP support organization for analysis. The information is sent to standard out by default. This command is valid only for VA 7110 and VA 7410 arrays.

-cf <*filename*>	Identifies the file that contains the command descriptor block (CDB). The CDB is specified in hex values (e.g. 0xa0) and defines the operation the array will perform.
-Cf *filename*	Identifies the file to which the core data (~48 MB) is sent. If not specified, the core data is sent to standard out. NOTE: When using the -Core option within armshell, the -Cf option should always be used. Using armdiag -Core without the -Cf switch will result in unpredictable behavior. Standard out will be receiving raw data that includes control characters, which may cause armshell to exit or exhibit other unusual behavior.
-d <*data*>	The data to write to the array specified in hex values (e.g. 0xa0). If the command returns data from the array, the data will be sent to standard out in both hex and ASCII.
-df <*filename*>	Identifies the file used to transfer data to or from the array. When writing data to the array, the data will be in hex values (e.g. 0xa0). When reading data from the array, the data will contain both hex and ASCII values. The specified file will be created automatically to store data returned from the array.
-dir <*direction*>	Defines the data transfer involved in the command: DATA_IN, DATA_OUT, or NO_DATA. The value depends on the accompanying CDB. DATA_IN - the CDB is expecting data to be returned from the array DATA_OUT - the CDB will send data to the array NO_DATA - the CDB requires no data
-f <*FRULocation*>	Identifies the FRU to which the pass-through command will be sent. *FRULocation* can be determined using the `armdsp -f` command.
-i <*iteration*>	An integer value that specifies how many times to send the command. If not specified, the command will be sent one time.
-I	Executes a predefined set of commands and outputs the results. The results will be displayed on the standard out device, unless the -if option is included. The commands invoked by the -I option are contained in a file named info.data, which resides in the /sanmgr/commandview/clients/config directory.
-if <*filename*>	Stores the results of the -I option in the file specified by <*filename*>. The information is stored using a zip compression algorithm. The .zip extension will be added automatically to the file name. Each command executed will have a separate file entry, with the exception of armlog -d. All armlog -d commands will be stored in a single file entry.

-p <*password*>	Identifies the password required to perform any SCSI pass-through commands. Contact HP Support for information on using the password.
-P	Sends a generic SCSI pass-through command to the hardware device identified by -f <*FRULocation*>.
-q	Suppresses the update output of the -I option.
-sf <*filename*>	Identifies the file used to store the status bytes of the command. If not present, the status will go to standard out.
-W	Display extended information about array warning states.
-?	Display extended help message. Overrides all other switches.

Command Examples

Send an Inquiry command to the controller on array alias array_14. The CDB for the command is stored in file inquiry.txt. The data returned will be stored in file controller.out.

```
armdiag -C -cf inquiry -p password -dir DATA_IN -df controller.out array_14
```

Send an Inquiry command to disk 6 in the array enclosure on array alias array_14. The CDB for the command is stored in file inquiry. The data returned will be stored in file disk.out.

```
armdiag -P -f M/D6 -cf inquiry -p password -dir DATA_IN -df disk.out array_14
```

Shutdown array autoraid_6 on host server4.

```
armdiag -C -c e8000000000000000000 -p password -dir NO_DATA server4:autoraid_6
```

Gather status information from array alias va_array_4 and store the results in file array_status.

```
armdiag -I -if array_status va_array_4
```

The status information will be stored in file va_array_4.zip, which can be viewed using a tool such as WinZip®.

armdiscover

Description

The `armdiscover` command performs a discovery that identifies all arrays attached to a host. In addition to being output to the screen, the results of this command are stored in a database file, which is accessed by the `armdsp -i` command to display array information. Command options allow the discovery and storage of results on remote hosts.

Note The `armdiscover` command should be run after adding a new array to a host on which Command View SDM is already running. This will add the new array to the management configuration.

In an OpenView SAM environment, the `armdiscover` command retrieves device information from the SAM database, and does not initiate a discovery process. Consequently, the command executes much quicker in SAM.

Syntax

armdiscover [<*managementhost*>] [-h <*devicehost*>] [-s] [-v] [-n] [-delete]

armdiscover -?

Options

<*managementhost*>	Identifies the host on which the results of the armdiscover process are stored. If not specified, the results are stored in the database on the local host on which the command is being run. This allows a remote client to initiate the armdiscover process and store the results on a different management station.
-h <*devicehost*>	Identifies the host which the armdiscover process will gather information from. This allows a management host to gather information about arrays connected to remote hosts. If not included, the default is <*managementhost*>.

-delete	Delete the database entries for all devices discovered on the host specified by <*devicehost*>. The entries are deleted from the database on the host identified by <*managementhost*>. This option is useful for deleting entries for a host that is no longer is use. Until the entries are deleted, icons for the arrays that were connected to the host will remain in the database and be displayed in the Launcher window.
-n	Causes the command to not run OpenDIAL. Instead, the results of the last OpenDIAL scan are used. This makes the armdiscover process faster in situations where the device configurations have not changed.
-s	Suppresses the display of discovered devices. You can use armdsp -i to display discovered devices at a later time.
-v	Displays additional information for each discovered device (see example below). The display consists of multiple lines per device.
-?	Display armdiscover help

Using armdiscover in a OpenView SAM environment

When Command View SDM is integrated into an OpenView SAM environment, `armdiscover` has little or no effect on the database maintained by SAM. This is the database used by Command View SDM to retrieve and display device information. This causes problems when changing the alias on a device seen by systems other than the one from which the `armdiscover` command was issued.

Also, if the `armdiscover -delete` command is used in an attempt to delete devices from the Command View SDM configuration, the devices will not be deleted from the SAM database. They will still appear in Command View SDM.

Examples

The following examples discovers the arrays connected to the host and outputs the results. The -v option is used for displaying additional information about each array.

```
armdiscover -v
This could take several minutes ...
Product ID:        HP-A6189A
  Device Path:     /dev/dsk/c5t15d0
  Serial Number:   00USP1001119
```

```
  Alias Name:       green
  World Wide Name: 50060b000009736f
  Unique ID:        HPA6189A00USP1001119

Product ID:         HP-A6188A
  Device Path:      /dev/rscsi/c25t12d0
  Serial Number:    00SG04990103
  Alias Name:       yellow
  World Wide Name: 50060b00000921a3
  Unique ID:        HPA6188A00SG04990103

Product ID:         HP-A6189A
  Device Path:      /dev/dsk/c4t0d0
  Serial Number:    00USP1001083
  Alias Name:       white
  World Wide Name: 50060b00000970bb
```

armdownload

Description

The `armdownload` command downloads firmware to the array. Firmware can be downloaded to the array main controllers, battery control circuitry, disk enclosure Link Control Cards (LCC), and disks.

Note Always refer to the README file provided with the firmware for specific download requirements.

Caution Only wrapped file formats should be used when downloading firmware to any component on the array. The use of wrapped files eliminates the possibility of downloading the wrong firmware file. Wrapped files can be identified by the .frm file extension. If the firmware file has another extension, it may be a raw firmware file. The potential for downloading the wrong firmware is increased when using raw files.

Syntax

armdownload -I {C | D | L | B } *<array-id>*

armdownload { -C | -B } [-O] *<fwFileName>* *<array-id>*

armdownload { -L | -D } *<FRULocation>* [, *<FRULocation>*, ...] *<fwFileName>* *<array-id>*

armdownload {-L | -D } -P *<productID>* *<fwFileName>* *<array-id>*

armdownload -M *<source_FRU>* *<array-id>*

armdownload -?

Options

-B	Download firmware to the battery control circuitry. The firmware will be automatically downloaded to both batteries.
-C	Download firmware to the array controllers. The firmware will be automatically downloaded to both controllers.
-D *<FRULocation>*	Download firmware to the disk identified by *<FRULocation>*. Multiple disks can be specified in the same command.

-D -P <*productID*>	Download firmware to the disk identified by the -P <*productID*> option. See the -P option for more information.
-I	Display a list of controllers (C), Disks (D), LCCs (L), or Battery controller (B) locations and firmware revision codes for the module type specified.
-L <*FRULocation*>	Download firmware to the disk enclosure LCC controller identified by <*FRULocation*>. Multiple controllers can be specified in the same command.
-L -P <*productID*>	Download firmware to the disk enclosure LCC controller identified by the -P <*productID*> option. See the -P option for more information.
-M <*source_FRU*>	Copy firmware from the array controller identified by <*source_FRU*> to the other array controller.
-O	Perform the download in an offline mode. This is required for family firmware version changes. An attempt to download a version family change with the array on-line, an error will be returned indicating that an off-line (-O) download is required. Note - during the download the array will not respond to I/O.
-P <*productID*>	Download firmware to all LCCs (C) or all disks (D) identified by <*productID*>, the product number of the module.
<*fwFileName*>	Identifies the file containing the firmware to be downloaded. The path must be included. Command View SDM creates the following default directories for firmware files, but firmware files may be placed in any directory. opt/sanmgr/commandview/client/fwdownload **<< HP-UX or Linux** <drive>:\Program Files\Hewlett-Packard\sanmgr\commandview\client\sbin\fwdownload <<**Windows**
<*FRULocation*>	Identifies the specific FRU that the download operation is to be performed on.
?	Display extended usage message. This option overrides all other switches.

About Firmware Files

The following information should be used when downloading firmware files.

- Firmware files for the HP StorageWorks Virtual Array products are available at the following locations on the HP Support web:

  http://www.hp.com/support/va7100
  http://www.hp.com/support/va7400

- When downloading firmware files, it is recommended that they be put in the `..\commandview\client\sbin` directory. This is the default location. If the files are placed in another location, the path must be specified.
- There are two types of firmware files, raw (.LOD) and wrapped (.FRM). Wrapped files contain header information that allow the download utilities to verify that the firmware file matches the hardware component. Use only wrapped files when downloading firmware.

New Firmware Revision Code Designation for VA 7410

The revision numbering for firmware has changed for the VA 7410. The revision numbering consists of a string of 4 ASCII characters (the HP designation has gone away). For example, a revision code of "X123" represents the following:

- X - Is a single capital letter (A - Z) designating the platform
- 1 - is a single number or capital letter (0-9, A-Z) designating a major FW revision
- 2 - is a single number or capital letter (0-9, A-Z) designating a minor FW revision
- 3 - is a single number or capital letter (0-9, A-Z) designating a sub-minor FW revision

The initial firmware release for the VA 7410 is A000.

Removing an Advisory Lock

During a firmware download, an advisory lock is installed to gain exclusive access to the component. If a lock is already in place, the download will fail and the following message will be displayed:

```
Failed to set the firmware download advisory lock
```

In this situation, the existing lock must be removed using the following command:

```
armmgr -b FwDownload <array-id>
```

Once the lock has been removed, retry the firmware download operation.

Downloading Controller Firmware On-Line or Off-Line

Controller firmware can be downloaded either on-line or off-line. If the changes to the firmware do not impact the mapping of controller memory, the on-line procedure can be used. This procedure is faster than the off-line download because it only involves a reset to the array.

If the changes to the firmware alter the controller memory mapping, the on-line procedure cannot be used. The off-line procedure must be used in this situation. A change to the memory mapping requires that the array perform a shutdown and restart, which is performed as part of the off-line procedure

Note When downloading controller firmware, always check the README file included with the firmware. (If you have access, you can also read the HP Service Note associated with the firmware download.) This information will identify whether you can perform the firmware download offline or online.

When downloading firmware off-line using the CLUI, the Command View SDM GUI should not be running in the background. There is a possibility that the GUI will not adapt to new array automatically. The GUI will have to be closed and restarted following the firmware download.

Examples

Disk Module Download

This example illustrates one method for downloading new firmware to the disk modules. Firmware is downloaded to all disks The firmware file is located in the default firmware directory

1 Identify the current product numbers and firmware versions of the disk modules on the array with alias MyArray:

```
armdownload -I D MyArray
```

The following output is displayed:

```
Vendor    Product ID  Rev   FRU Location
```

```
HP 36.4G  ST336704FC  HPC1  M/D1
HP 36.4G  ST336704FC  HPC1  M/D2
HP 36.4G  ST336704FC  HPC1  M/D2
HP 18.2G  ST318451FC  HPC0  M/D5
HP 18.2G  ST318451FC  HPC0  M/D6
HP 18.2G  ST318451FC  HPC0  M/D7
HP 18.2G  ST318451FC  HPC4  M/D8
```

2 Copy the latest firmware file (HPC3 in this example) for the ST336704FC disks to the host.

3 Download the HPC3 firmware file to all ST336704FC disk modules by entering the following command:

```
armdownload -D -P ST336704FC ST336704.HPC3 MyArray
```

Array Controller Firmware Download

This example downloads firmware to the array controller. The `armdownload` command is used to identify the controllers and then download the firmware. The firmware file is located in the default firmware directory.

1 Identify the current firmware versions of the array main controllers for array MyArray:

```
armdownload -I C MyArray
```

The following output is displayed:

```
Vendor    Product ID  Rev    FRU Location
HP        A6188A      HP02   M/C2
HP        A6188A      HP02   M/C2
```

2 Copy the appropriate firmware file (A6188AHP10.frm in this example) to the host.

3 Download the new firmware file to either array controller by entering the following command:

```
armdownload -C A6188AHP10.frm MyArray
```

When new firmware is downloaded to one controller or battery, the new firmware will be automatically copied to the other controller or battery. If a family change version of firmware is being downloaded, an error message will be returned indicating that this is a family firmware version change and must be performed in an offline state. For off-line downloads, the off-line option (-O) is included in the command:

```
armdownload -C -O A6188AHP10.frm MyArray
```

armdsp

Description

The `armdsp` command is used to display status and configuration information for the array identified by <*array-id*>. Logical configuration, physical configuration, and current status can all be displayed. A list of the array IDs of all the arrays connected to the host can also be displayed.

Syntax

armdsp {-a [-r] | -c [<*FruLocation*>] | -d [<*FruLocation*>] | -e [<*FruLocation*>] | -f | -L [*LUN*] [-r] | -p [<*FruLocation*>] | -ps | -s | -t } <*array-id*>

armdsp { -i [<*HostName*>] } [-b | -v]

armdsp { -vfp [<*FruLocation*>] } <*array-id*>

armdsp <*array-id*>

armdsp -?

Options

None	Display general information about the array. This includes product and vendor information, array state, and capacity usage.
-a [-r]	Display the information presented by all other options. This is a quick way of displaying all configuration and status information about the array. If the -r option is included, the allocated space for all the LUNs are displayed. This command will also print the version of Command View.
-c [<*FRULocation*>]	Display controller information. If <*FRULocation*> is not given, display detailed information for each controller. If <*FRULocation*> is given and specifies an enclosure (e.g., JA1), display detailed information for each controller. If <*FRULocation*> is given and specifies a controller (e.g., JA1/C1), display detailed information only for that controller.

-d [<*FRULocation*>]	Display disk information. If <*FRULocation*> is not given, display detailed information for all disks installed in the array. If <*FRULocation*>is given and specifies an enclosure (e.g., JA1), display detailed information for all disks in the enclosure at <*FRULocation*>. If <*FRULocation*> is given and specifies a disk (e.g., JA1/D1), display detailed information for disk at <*FRULocation*> only.
-e [<*FRULocation*>]	Display enclosure information. If <*FRULocation*> is not given, display a summary listing of all enclosures. If <*FRULocation*> is given and specifies an enclosure, display detailed information for the enclosure at <*FRULocation*> only.
-f	Display a listing of FRUs in the array. Include FRU location, description of hardware, identification, and status.
-i [<*HostName*>] [-b | -v]	Display the serial number, alias, world wide name, device file name and unique name of all arrays connected to the host. <*HostName*> denotes the remote host for which information will be displayed. If no value is specified, local host will be assumed. If the -b option is included, an abbreviated list is displayed. If the -v option is included, a detailed list of devices, including all known preferred management paths to each device, is displayed.
-L [<*LUN*>] [-r]	Display LUN information. If <*LUN*> is not specified, display detailed information for all LUNs on the array. If <*LUN*> is specified, display information only for that LUN. If the -r option is included, the allocated space for all the LUNs are displayed. If the LUN is a business copy, then business copy information will be displayed. If the LUN has one or more business copies, list how many and the corresponding LUN ID. Also, its active and its attachment states with its used capacity will be displayed. All listed LUNs will be shown with corresponding world wide names (WWN).
-p [<*FRULocation*>]	For firmware versions HP15 or greater (VA7100/7400) and A000 or greater (VA7410/7110), this option displays all port settings for the port identified by <*FruLocation*>. This includes Port Loop ID, Port Behavior, Port Topology, Port Data Rate, and Queue Full Threshold. If <*FruLocation*> is not specified, the data is displayed for all host and disk ports.

-ps	Displays the host and disk port metrics. Contact HP support for more information on these metrics.
-s	Display Array Status, Warnings and Subsystem Parameter information for the array. This includes the configuration settings that control the operation of the entire array. This command will also print the version of Command View.
-t	Display topology of back end ports. This display identifies the controller paths to each disk in the array, the disk address, and the disk loop map. For example, disk 1 in the controller (main) enclosure would be displayed as follows: M/D1 (M/C1.J1, M/C2.J1)* See example below for more detail.
-vfp [<*FruLocation*>]	Displays the VFP settings such as the Baud Rate and Paging Value. If <*FruLocation*> is included and specifies either a controller (M/C1) or a VFP port (M/C1.VFP), only the VFP information for that controller will be displayed. If <*FruLocation*> is not included, VFP information for all VFP ports within the enclosure will be displayed.
-?	Display extended Usage message. This option overrides all other switches.

Examples

Displaying Controller Information

Display the controller information for array with alias white.

```
armdsp -c white

Vendor ID:_____________________________HP
Product ID:____________________________A6189A
Array World Wide Name:_________________50060b00000970bb
Array Serial Number:___________________00USP1001083
Alias:_________________________________white
------------------------------------------------------------

Controller At M/C2:
  Status:______________________________Good
  Serial Number:_______________________00PR00165518
  Vendor ID:___________________________HP
  Product ID:__________________________A6189A
```

```
  Product Revision:_____________________HP17
  Firmware Revision:____________________38370HP17P0829021443
  Manufacturing Product Code:___________IJMTU00012
  Controller Type:______________________HP StorageWorks Virtual Array 7400
  Battery Charger Firmware Revision:____4.1
  Front Port At M/C2.H1:
    Status:_____________________________Good
    Port Instance:______________________0
    Hard Address:_______________________31
    Link State:_________________________Link Up
    Node WWN:___________________________50060b00000970bb
    Port WWN:___________________________50060b00000991d6
    Topology:___________________________Private Loop
    Data Rate:__________________________1 GBit/sec
    Port ID:____________________________31
  Back Port At M/C2.J1:
    Status:_____________________________Good
    Port Instance:______________________0
    Hard Address:_______________________125
    Link State:_________________________Link Up
    Node WWN:___________________________50060b00000970bb
    Port WWN:___________________________50060b00000991d7
    Topology:___________________________Private Loop
    Data Rate:__________________________1 GBit/sec
    Port ID:____________________________125
  Battery at M/C2.B1:
    Status:_____________________________Good
    Identification:_____________________2974:MOLTECHPS:NI2040:2001/2/14
    Manufacturer Name:__________________MOLTECHPS
    Device Name:________________________NI2040
    Manufacturer Date:__________________February 14, 2001
    Remaining Capacity:_________________4570 mAh
    Remaining Capacity:_________________91 %
    Voltage:____________________________12101 mVolts
    Discharge Cycles:___________________4  <-- See below for more details on this value
  Processor at M/C2.PM1:
    Status:_____________________________Good
    Identification:_____________________HP:A6189A:HP17
  DIMM at M/C2.M1:
    Status:_____________________________Good
    Identification:_____________________512
    Capacity:___________________________512 MB

Controller At M/C1:
  Status:_______________________________Good
  Serial Number:________________________00PR00165506
```

```
  Vendor ID:_____HP
  Product ID:_____A6189A
  Product Revision:_____HP17
  Firmware Revision:_____38370HP17P0829021443
  Manufacturing Product Code:_____IJMTU00012
  Controller Type:_____HP StorageWorks Virtual Array 7400
  Battery Charger Firmware Revision:____4.1
  Front Port At M/C1.H1:
    Status:_____Good
    Port Instance:_____0
    Hard Address:_____126
    Link State:_____Link Up
    Node WWN:_____50060b00000970bb
    Port WWN:_____50060b0000099172
    Topology:_____Point To Point, Fabric Attached
    Data Rate:_____2 GBit/sec
    Port ID:_____0x11500
  Back Port At M/C1.J1:
    Status:_____Good
    Port Instance:_____0
    Hard Address:_____125
    Link State:_____Link Up
    Node WWN:_____50060b00000970bb
    Port WWN:_____50060b0000099173
    Topology:_____Private Loop
    Data Rate:_____1 GBit/sec
    Port ID:_____125
  Battery at M/C1.B1:
    Status:_____Good
    Identification:_____2568:MOLTECHPS:NI2040:2001/2/14
    Manufacturer Name:_____MOLTECHPS
    Device Name:_____NI2040
    Manufacturer Date:_____February 14, 2001
    Remaining Capacity:_____4506 mAh
    Remaining Capacity:_____90 %
    Voltage:_____12262 mVolts
    Discharge Cycles:_____13
  Processor at M/C1.PM1:
    Status:_____Good
    Identification:_____HP:A6189A:HP17
  DIMM at M/C1.M1:
    Status:_____Good
    Identification:_____512
    Capacity:_____512 MB

Controller At JA0/C2:
```

```
Status:_____________________________Good
Serial Number:______________________SGY109910001
Vendor ID:__________________________HP
Product ID:_________________________A6214A
Product Revision:___________________HP01
Controller Type:____________________HP StorageWorks Disk System DS2400
Enclosure Switch Setting:___________0
Drive Address Basis:________________0
Enclosure ID:_______________________0
Loop Pair:__________________________0
Loop ID:____________________________15
Hard Address:_______________________15
```

More About Battery Discharge Cycles

The battery Discharge Cycles value represents the total number of times a complete discharge/recharge cycle of the battery capacity has occurred. This need not be a single discharge cycle from 100% to 0%. It could be two cycles of 100% to 50%, four cycles of 100% to 75%, etc. The key factor is that the entire capacity of the battery has been discharged and recharged for each count.

The battery initiates a reconditioning cycle when necessary. This causes the battery to go through a full discharge/recharge cycle. Each reconditioning cycle adds to the total Discharge Cycles count.

Displaying FRU Information

Display the FRU information for array with alias yellow.

```
armdsp -f yellow

Vendor ID:__________________________HP
Product ID:_________________________A6188A
Array World Wide Name:______________50060b00000921a3
Array Serial Number:________________00SG04990103
Alias:______________________________yellow
------------------------------------------------------------

FRU       HW COMPONENT   IDENTIFICATION                  ID STATUS
=============================================================================
M         Enclosure      00SG04990103                       Good
M/P1      Power Supply   82004EK00319                       Good
M/P2      Power Supply   82004EK00348                       Good
M/MP1     MidPlane       000484710194                       Good
M/C1      Controller     00USP1001286                       Good
M/C1.H1   Host Port      <none>                             Good
```

```
M/C1.J1    BackEnd Port    <none>                              Good
M/C1.G1    Host GBIC       A282Y2M                             Good
M/C1.B1    Battery         441:MOLTECHPS:NI2040:2000/10/31     Good
M/C1.PM1   Processor       HP:A6188A:HP11                      Good
M/C1.M1    DIMM            512                                 Good
M/C2       Controller      00USP1001294                        Good
M/C2.H1    Host Port       <none>                              Good
M/C2.J1    BackEnd Port    <none>                              Good
M/C2.G1    Host GBIC       A150033                             Good
M/C2.B1    Battery         163:MOLTECHPS:NI2040:2000/9/29      Good
M/C2.PM1   Processor       HP:A6188A:HP11                      Good
M/C2.M1    DIMM            512                                 Good
M/D1       Disk            3CC03RX50000                        Good
M/D2       Disk            3CC03V4Y0000                        Good
M/D3       Disk            3CC03S3F0000                        Good
M/D4       Disk            3CC03Q470000                        Good
M/D5       Disk            3CC03RJ00000                        Good
M/D6       Disk            3CC03S770000                        Good
M/D7       Disk            3CC03BCS0000                        Good
```

Displaying Disk Information

Display the information for disk 2 in the main enclosure on array with alias green.

```
armdsp -d M/D2 green

Vendor ID:_____________________________HP
Product ID:____________________________A6189A
Array World Wide Name:_________________50060b000009736f
Array Serial Number:___________________00USP1001119
Alias:_________________________________green
------------------------------------------------------------
Disk at M/D2:
  Status:______________________________Good
  Disk State:__________________________Included
  Vendor ID:___________________________HP 36.4G
  Product ID:__________________________ST336704FC
  Product Revision:____________________HPC3
  Data Capacity:_______________________33.378 GB (70,000,000 blocks)
  Block Length:________________________520 bytes
  Address:_____________________________112
  Node WWN:____________________________2000002037e70ba7
  Initialize State:____________________Ready
  Redundancy Group:____________________2
  Volume Set Serial Number:____________0000FFEE00000031
```

```
  Serial Number:_____________________3CD1NRP5
  Firmware Revision:_________________HPC3
```

Displaying Disk Path Information

Display the controller path information for each disk in the array.

```
armdsp -t Array1

Vendor ID:_____________________________HP
Product ID:____________________________A6189B
Array World Wide Name:_________________50060b000009207f
Array Serial Number:___________________00USP1001038
Alias:_________________________________Array1
------------------------------------------------------------
                                (addresses are 0 based)
Disk      Controller paths to   Encl   Hard   Assigned
Fru       disks                 Addr   Addr   Addr
-------   ------------------    ----   ----   --------
M/D1      (M/C2.J1, M/C1.J1)*   0x6f   0x6f   0x6f
M/D2      (M/C2.J1, M/C1.J1)*   0x70   0x70   0x70
M/D3      (M/C2.J1, M/C1.J1)*   0x71   0x71   0x71
M/D4      (M/C2.J1, M/C1.J1)*   0x72   0x72   0x72
M/D5      (-------, -------)*   0x73   ----   ---- #
M/D6      (M/C2.J1, M/C1.J1)*   0x74   0x74   0x74
JA0/D1    (M/C2.J1, M/C1.J1)*   0x00   0x00   0x00
JA0/D2    (M/C2.J1, M/C1.J1)*   0x01   0x01   0x01
JA0/D3    (M/C2.J1, M/C1.J1)*   0x02   0x02   0x02
JA0/D4    (M/C2.J1, M/C1.J1)*   0x03   0x03   0x03
JA0/D5    (M/C2.J1, M/C1.J1)*   0x04   0x04   0x04
JA0/D6    (M/C2.J1, M/C1.J1)*   0x05   0x05   0x05
JA0/D7    (M/C2.J1, M/C1.J1)*   0x06   0x06   0x06
JA0/D8    (M/C2.J1, M/C1.J1)*   0x07   0x07   0x07
JA0/D10   (M/C2.J1, M/C1.J1)*   0x09   0x09   0x09
JA0/D14   (M/C2.J1, M/C1.J1)*   0x0d   0x0d   0x08 #
JA0/D15   (M/C2.J1, M/C1.J1)*   0x0e   0x0e   0x0e

Note: "*" indicates the drive is physically present
      in the specified enclosure.

      "#" indicates that one or more addresses do not match the
      enclosure address (Encl Addr).

================================================
Drives Listed in Physical Loop Order
================================================
M/C1.J1   M/C2.J2   M/C1.J2   M/C2.J2
```

```
-------   -------   -------   -------
M/D4      M/D4      -------   -------
M/D3      M/D3      -------   -------
M/D2      M/D2      -------   -------
M/D1      M/D1      -------   -------
JA0/D15   JA0/D15   -------   -------
JA0/D7    JA0/D14   -------   -------
JA0/D14   JA0/D10   -------   -------
JA0/D8    JA0/D6    -------   -------
JA0/D10   JA0/D7    -------   -------
JA0/D2    JA0/D5    -------   -------
JA0/D1    JA0/D8    -------   -------
JA0/D6    JA0/D1    -------   -------
JA0/D5    JA0/D4    -------   -------
JA0/D4    JA0/D3    -------   -------
JA0/D3    JA0/D2    -------   -------
M/D6      M/D6      -------   -------
M/D5      M/D5      -------   -------
```

Interpreting Disk Path Information

The disk path information is presented in two tables. The first table identifies the controller paths to each disk, and indicates if the disk is physically present. If the path information contains a series of hyphens (---), it indicates that the path to the disk cannot be determined because the controller cannot see the disk. See disk M/D5 in the preceding example.

The table also lists the addresses assigned to each disk. The addressing information can be used to identify problems with the array. The three address fields (Encl Addr, Hard Addr, Assigned Addr) should be the same value.

If the values differ, a problem has occurred. If the Encl Addr and the Hard Addr fields differ, it may be a result of a hardware failure, such as a bent connector pin or a backplane failure. If the Hard Addr and the Assigned Addr fields differ, it may be caused by a hardware failure or resetting an enclosure address switch.

The second table is a loop map identifying the physical order in which the disks are accessed on the loop. This map reflects the physical Fibre Channel cable connections used to connect the external disk enclosures. Communication on the loop does not occur in a simple, orderly sequence. The relationship between the physical location of a disk and the order in which it is accessed can be complex.

The order in which disk are accessed is important when analyzing port error rate metrics. Knowing the order in which communication on the loop occurs can facilitate isolating the problem. For example, if a disk is experiencing a high error rate on one of its ports, knowing which disk is the predecessor in the loop can help identify which disk or path may be at fault.

armfeature

Description

The `armfeature` command installs upgrade licenses for increasing the capacity limits for Business Copy VA and Secure Manager VA. Entitlement licenses are purchased as separate options. With the purchase of an option, you receive a license key which is installed using this command.

Note The license key used to implement the feature is case sensitive. Make sure the key is entered exactly as generated. If the key is entered incorrectly, the feature will indicate a status of Disabled.

Syntax

armfeature –r *<array-id>*

armfeature –a –f *<featurestring>* -k *<key>* *<array-id>*

armfeature -?

Options

-a	Specifies that the new feature indicated by the -f parameter, with a key value indicated by the -k parameter is to be written to the array. The *<featurestring>* and the *<key>* values are taken from the Enablement License certificate (or as provided by the supplier).
-f *<featurestring>*	Specifies the string corresponding to the feature to be added. This string is obtained during the product registration process.
-k *<key>*	Specifies the key value for the new feature to be added. This value is generated during the product registration process.
-r	This specifies that the feature table should be read from the device and displayed on the standard output. If no features are installed, the table will be empty.
-?	Display extended help message. Overrides all other switches.

Examples

Display the feature table for array alias Array1. A 500 GB feature has been installed for both Business Copy and Secure Manager LUN security on the array.

```
hpbs9011:# armfeature -r Array1

FEATURE                              LICENSE KEY                    STATE
=========================================================================
BUSINESS_COPY_500GB                  0210E8AD9FD8                   Active
LUN_SECURITY_500GB                   FD47411C79C7                   Active
```

Display the feature table for array alias green. A 5000 GB feature has been successfully installed for Secure Manager LUN security, but the key for the 2000 GB Business Copy feature was incorrectly entered, causing the feature to have a status of Invalid Key.

```
hpbs9011:# armfeature -r green

FEATURE                              LICENSE KEY                    STATE
=========================================================================
BUSINESS_COPY_2000GB                 C854CE3C3D99               Invalid Key
LUN_SECURITY_5000GB                  A91833AC76F6                   Active
```

Invalid Key status indicates the license key for this upgrade was entered incorrectly

armfmt

Description

The `armfmt` command allows a user to format the array. The entire array identified by *<array-id>* is formatted.

Caution `armfmt` is a destructive command. Data on the array will be destroyed following successful completion of this command. Backup all vital data before performing a format.

Syntax

armfmt -f [-h] *<array-id>*

armfmt -?

Options

-f [-h]	Format the entire array identified by *<array-id>*. The -f option formats all disks that are currently included in the array configuration. If the -h option is specified, disks that are installed in the array but are not included in the array configuration are also formatted.
`-?`	Display extended help message. Overrides all other switches.

Examples

Format array serial number 00USP1001083 . Format all disks, even those not included in the array configuration.

```
armfmt  -f  -h  00USP1001083
```

armhost

Description

The `armhost` command is used to manage the array's host port behavior table. This table maps each host to an associated operating system-dependent communication protocol or behavior. Each operating system communicates differently with the array, so the array must be aware of what operating system each host is running. The host port behavior table is the mechanism by which the array identifies the host operating system.

Note On the VA 7100 and VA 7400, the maximum number of host port behavior table entries is 32. On the VA 7410/7110, the maximum number of table entries is 113.

Syntax

armhost {-r -f <*filename*>} <*array-id*>

armhost {-w [-c] -f <*filename*>} <*array-id*>

armhost {-d <*WWN*>} <*array-id*>

armhost {-c} <*array-id*>

armhost {-t [-h <*hostList*>] [-f <*filename*>]} <*array-id*>

armhost {-cp -ws <*WWN*> -wd <*WWNList*>} <*array-id*>

armhost -?

Options

-c	Clears the entries in the array's host port behavior table. This option may be used alone or in combination with the -w option to clear the table prior to a write.
-cp	Copies behavior from one WWN to one or more other WWNs.
-d <*nodeWWN*>	Deletes all entries in the array's host port behavior table for the host specified by <*nodeWWN*>. This is useful when a host is no longer accessing the array.

-f <*filename*>	Identifies the file for the host port behavior table information. Table information read from the array is written to this file, and the content of this file is written to the array to update the table information. Relative or absolute file paths are allowed. If a path is not specified, the current working directory will be used.
-h <*hostList*>	Retrieves the WWN for the hosts identified in <*hostList*>, a comma-separated list of DNS names or IP addresses. The retrieved WWNs will be written to the specified file if the -f option is included, or displayed on the screen. This option is only valid with the -t option. A host must be running Command View SDM to be used successfully with this option. If a specified host is not running Command View SDM, it will be skipped without alerting the user.
-r	Reads the host port behavior table from the array and writes the contents to the file specified by –f <*filename*>.
-t	Retrieves the WWNs of hosts running Command View SDM. If the -h option is not included to identify specific hosts, an attempt will be made to locate all hosts running Command View SDM. The retrieved WWNs will be written to the specified file if the -f option is included, or displayed on the screen. The WWNs will be listed under their respective hosts.
-w	Writes the contents of the file specified by –f <*filename*> to the array host port behavior table.
-wd <*WWNList*>	Identifies the destination WWN or WWNs that will be added to the host port behavior table. *WWNList* can be a single WWN or a comma separated list of WWNs. This option is only used with the -cp and -ws options.
-ws <*WWN*>	Identifies the source WWN from which host port behavior information will be copied. *WWN* must already exist in the host port behavior table on the array. This option is only used with the -cp and -wd options.
-?	Display extended help message. Overrides all other switches.

The host port behavior defines the communication protocol the array uses to communicate with each supported operating system. To determine which behavior to select for communication, the array maintains a table that maps a specific behavior to a host, identified by its WWN. When the array receives a communication from a host, it uses the host's WWN to select a behavior from the table. Entries in the behavior array table are made by downloading a user created file to the array using the `armhost` command. If a behavior

for a host is not include in the table, the default controller behavior will be used.

Creating the Host Port Behavior Table

The host port behavior table is created as a text file which is downloaded to the array. The entries in the file are used to create the array's host port behavior table. The file contains two values per line: one value identifying the WWN of the host, and one value specifying the host operating system. Blank lines or lines starting with the character "#" are ignored.

File entries use the following format:

```
<node_WWN>  <host_port_behavior>
```

<node_WWN> is the node WWN or port WWN of the host
<host_port_behavior> identifies the host operating system. The values for each OS are listed in the following table>

Host Operating System	<host_port_behavior> Value
HP-UX	HPUX
Windows 2000	Win2000
Windows NT	WinNT
Linux Red Hat	Linux
Sun Solaris	Solaris
Novel Netware	NetWare
IBM AIX	AIX
MPE/iX	MPE
Compaq Tru64[1]	Tru64
Compaq OpenVMS[1]	OpenVMS
Other operating systems[1]	UnsupportedOS
[1] Supported on firmware versions HP14 and later	

<node_WWN> identifies the WWN connection to the host. A host connection may be the host WWN or it may be the host adapter WWN. Either the node or port WWN may be used. For hosts that have multiple host adapters, more than one entry (WWN) per host may be required in the host port behavior table. Depending on the operating system, a host's node

WWN may not be passed through multiple host adapters to the array. In this case, the array will see the host's multiple host adapter WWNs. In this situation, multiple host adapter WWNs must be entered into the table to represent the host.

Example

Create the host port behavior table on a new array for an environment with three hosts: one HP-UX (with two host adapters), one Windows NT (with two host adapters), and one Linux (with one host adapter). If the controller host port behavior is set to the default HP-UX behavior, entries for HP-UX host are not be required in the table, but they are included in this example.

1. Log on as system administrator.
2. Obtain the World Wide Name for each host or host adapter.
3. Read the current host port behavior from array alias Array15 into file `HPBset.txt`:

   ```
   armhost -r -f HPBset.txt Array15
   ```

   Because this is a new array, the existing file will be empty. On existing arrays this step provides you with a starting point for editing the table
4. Using a text editor, edit file `HPBset.txt`. Add the necessary entries for the three hosts. The table entries would look similar to this:

   ```
   00a05032243f1106  WinNT  << Windows NT host adapter 1
   7d876a1243d090a3  WinNT  << Windows NT host adapter 2
   200a6b34b7894284  Linux  << Linux host adapter
   20a60088g132ca32  HPUX   << HP-UX host adapter 1
   20a4208c0132c06b  HPUX   << HP-UX host adapter 2
   ```
5. Save the file.
6. Download the updated file to the array:

   ```
   armhost -w -f HPBset.txt Array15
   ```

   The path for the file is not shown for this example, but must be included if required.

armlog

Description

The `armlog` command displays the controller and disk logs maintained by the array. These logs contain information useful for diagnosing and troubleshooting. This command involves only event logs and does not display performance logs.

Syntax

armlog {-c [-s <*StartDateTime*>] [-e <*EndDateTime*>] [-pg <*pagetype*>] [-sv <*severityList*>] [-xml]} <*array-id*>

armlog {-d <*FruLocation*> [-p <*pagenumber*>]} <*array-id*>

armlog -?

Options

-c	Display the contents of the array's controller event log.
-d <*FRULocation*> [-p <*pagenumber*>]	Display the contents of the log for the disk installed in <*FRULocation*>. The –p option returns the log information identified by <*pagenumber*>. The use of the –p option is intended primarily for accessing logs on unsupported disks. The <*pagenumber*> value can be either decimal or hex (preceded with 0x).
-e <*EndDateTime*>	Display controller logs that occurred on or before <*EndDateTime*>. If a start date is specified using the -s option, all logs between the start and end dates are displayed. If neither the start nor end times are specified, all controller events are displayed. The format of <*EndDateTime*> is MMddhhmm[yyyy]: MM Month (01-12) dd Day (01-31) hh Hour (00-23) mm Minute (00-59) yyyy Year (uses current year if not given)

-pg <*pagetype*>	Display controller logs of the type specified by <*pagetype*>. Values for <*pagetype*> can be Events, NV, or Critical. The entries included on each page type are determined by their severity level. See the -sv option for severity levels. Events page includes all entries (levels 0-4); NV page includes entries of moderate severity (levels 2 and 3); Critical page includes entries of the highest severity (level 4). If this option is not included, all logs on the Events page are displayed. This option should not be used with the -sv option.
-s <*StartDateTime*>	Display controller logs that occurred on or after <*StartDateTime*>. If an end date is specified using the -e option, all logs between the start and end dates are displayed. If neither the start nor end times are specified, all controller events are displayed. The format of <*StartDateTime*> is MMddhhmm[yyyy]: MM Month (01-12) dd Day (01-31) hh Hour (00-23) mm Minute (00-59) yyyy Year (uses current year if not given)
-sv <*severitylist*>	Display only controller logs of the severity level specified by <*severityList*>. The <*severityList*> can be a comma-separated list (0,1,2) or a range (0-2). Valid severity levels are 0 - 4, with 4 being the most severe. If this option is not specified, all logs regardless of severity are displayed. This option should not be used with the -pg option.
-xml	Creates output in XML format.
-?	Display extended help message. Overrides all other switches.

Examples

Display the controller event log for array serial number 00786b5c0000. Limit the entries to those that occurred on or after 0800 on May 15 of this year.

```
armlog -e -t 05150800 00786b5c0000
```

Display the log information for the disk installed in slot 3 of disk enclosure 2 on FC loop 1 on array identified by device file /dev/dsk/c2t0d0.

```
armlog -d JA2/D3 /dev/dsk/c2t0d0
```

armmgr

Description

The `armmgr` command manages the configuration parameters of the array. These settings control the operation of the entire array, consequently, every LUN on the array will be affected by any changes made using this command. This command also allows you to shutdown, restart, and reset the array.

Changing some of the array settings may require that the array be reset using the -R option. The user will be prompted to initiate a reset if the modified setting requires this action.

Note Several of the `armmgr` options are used to set the array Fibre Channel arbitrated loop (FC-AL) operating parameters. These parameters control the transfer of data between the host and array and typically do not need to be changed. Before changing a FC-AL setting, make sure you understand what effect it will have on array operation. Selecting an incorrect setting may make it impossible for the host to access the array.

Syntax

For all firmware versions:

```
armmgr {-a <on | off> |
 -b {CreateLun | FwDownload | Security | Select | PassThru | HostPort} |
 -c <FRULocation> |
 -d |
 -D <alias>} |
 -f {on | off} |
 -i {on | off} |
 -J {SingleController | Secure | Normal | RestrictedNormal | HighPerformance}
 -l <FRULocation> <value> |
 -n <value> |
 -p {start | disable}|
 -r {on | off} |
 -R [full | partial] |
 -s {shut | start} |
 -t <value> |
 -w {on | off} |
```

-x {on | off} |
<*array-id*>

armmgr -?

For firmware versions HP15 or greater (VA7100/7400) and A000 or greater (VA7410/7110)

armmgr {-P {on | off | true | false} |
-hd {on | off} |
-pd {1GB | 2GB} <*FruLocation*> |
-pv <*value*> <*FruLocation*> |
-q <*value*> <*FruLocation*> |
-S {on | off | true | false}}
<*array-id*>

For firmware versions HP11 and greater:

armmgr -B
{Hpux|WinNT|Win2000|Linux|Solaris|AIX|NetWare|Tru64|MPE|OpenVMS|SunCluster|
UnsupportedOS} <*FRULocation*> |
-C {raid1+0 | hpautoraid} |
-h {None | Automatic | LargestDisk | LargestTwoDisks} |
-I <*FRULocation*> {on | off} |
-o {on | off | true | false} |
-q <*value*> |
-V {1 | 2} |
-y {private | public | fabric} <*FRULocation*>
<*array_id*>

For firmware versions HP01 and HP02:

armmgr -B {HpuxFCDriver|Windows/LinuxFCDriver} <*FRULocation*> |
-h {on|off} |
-y {automatic|private|public|fabric} <*FRULocation*>
<*array_id*>

Options

-a {on | off }	Sets Auto Rebuild on or off. When enabled, redundancy should be rebuilt automatically whenever a drive becomes unavailable. A value of off indicates that rebuilds should not occur until explicitly stated.
-b { CreateLun | FwDownload | Security | Select | PassThru | HostPort }	Break the advisory lock. For example, if the array aborts a download (or if the download fails to complete), portions of the GUI may stop functioning due to an advisory lock being set. If this happens you will need to break the lock using the armmgr -b command. The advisory lock is the result of some error condition which must be resolved before the action can be completed without an advisory lock occurring.
-B {*operating_system}* <*FRULocation*>	Sets the controller host port behavior for the indicated operating system. Note that the supported operating systems vary by firmware release. <*FRULocation*> identifies the host port for which the behavior is to be set. For example, to set the behavior for host port 1 on controller 2, enter M/C2.H1. **Note** The UnsupportedOS value should only be used for a host running an operating system that is not included in the supported values. It is the user's responsibility to ensure that any unsupported host can access the array and transfer data properly using the UnsupportedOS behavior. HP is not responsible for any data loss that may occur when using the UnsupportedOS behavior.
-c <*FRULocation*>	Instructs the device to perform a reset to one of its internal fibre channel links specified by <*FRULocation*>. This command is used when the array is an unknown state.
-C {raid1+0 | hpautoraid}	Sets the RAID level for the entire array. RAID 1+0 operation attempts to store all data using RAID1+0 storage techniques. Some failure conditions may force the data into other RAID modes temporarily. hpautoraid - attempts to maintain the best performance while maximizing storage efficiency. Data is moved automatically between RAID 1+0 and RAID 5 DP. NOTE. The RAID level can be changed from RAID 1+0 to AutoRAID on-line. However, a full backup of all data should be done before changing the RAID level. The RAID level cannot be changed from AutoRAID to RAID 1+0 on-line. This change requires a reformat of the entire array, which will destroy all data. Backup all data before making this change.

-d	Set the fibre channel to its default settings.
-D <*alias*>	Set the array alias name (limited to 256 bytes).
-f {on | off}	Set Auto Format Drive on or off. Default is on. When enabled, any disk that does not have 520-byte sectors will be automatically reformatted when installed in the array. If the disk already has 520-byte sectors, no formatting operation will take place.
-h {None|Automatic| LargestDisk | LargestTwoDisks}	Specify Hot Spare operation. Default is Automatic. None - no hot spare. Automatic - the array will determine the appropriate amount of hot spare space. For 15 or fewer disks in a redundancy group, the array will reserve enough capacity to rebuild the largest disk. For 16 or more disks, the array will reserve enough capacity to rebuild the two largest disks. LargestDisk - reserve enough space to complete a rebuild after a failure or removal of the largest drive in the redundancy group. LargestTwoDisks - reserve enough space to complete a rebuild after a failure or removal of the largest two drives in the redundancy group
Firmware HP01 and HP02: -h {on|off}	On - turn on hot spare Off - turn off hot spare
-hd {on|off}	Enable Hang Detection. Default is on. Hang detection should only be disabled if continued controller resets are occuring as the result of false triggers.
-i {on | off}	Set Auto Include on or off. Default is on. On allows the array to automatically include any disk when it is installed into the array: Off requires the disk to be manually included after it is installed.
-I <*FRULocation*> {on | off}	Identify an FRU location by flashing the FRU LED: on - flash an LED on the FRU, if possible off - stop flashing the LED.

-J {SingleController | Secure | Normal | RestrictedNormal | HighPerformance}	Set Resiliency Level. This option sets the level of protection offered by data resiliency. It determines how often the contents of the controller maps are copied to the disk. Keeping the map information on the disks protects against controller map loss. SingleController is used if the array is operating with only one controller. This suppresses the single controller warning messages that are normally generated when only one controller is operating. Secure continually updates the disks at regular intervals. This option offers both data protection and good performance. Normal is the standard resilient map processing. This results in higher performance than Secure, but the risk of map loss is less than the HighPerformance configuration. RestrictedNormal has higher performance than Secure, but less than Normal, but the risk of map loss is less than the HighPerformance and Normal configuration. HighPerformance updates the disk maps only during shutdown of the array. This is the lowest level of data protection, but it offers the highest level of performance.
-l <*FRULocation*> <*value*> (lower case "L")	Set the Port Loop ID of the host port to the ID specified by <*value*>. The valid range of IDs is 0-125. <*FRULocation*> identifies the host port for which the Port Loop ID is being set. For example, to set the ID for host port 1 on controller 2, enter M/C2.H1.
-n <*value*>	Set a limit on the number of LUNs that may be created. This number will be rounded up to the nearest power of two within the device.
-o {on | off | true | false }	Set the Optimize Policy on (true) or off (false). The default is on. The optimization policy manages the movement of data within the array between RAID 1+0 and RAID 5DP. The distribution of data is intended to provide optimum performance and should be left enabled in most situations. When optimization is enabled, data will be moved from RAID 5DP to RAID 1+0 when necessary to improve performance. Disabling optimization will stop the migration of data from RAID 5DP to RAID 1+0. One environment in which it may be desirable to disable optimization is when performing large numbers of sequential writes. In this case, disabling optimization may result in improved performance by leaving data in RAID 5DP.

-p <start | disable>	Set the current state of the scrubbing policy <setting> can take any one of the following values: start, disable.
-P {on|off|true|false}	Controls whether the cache will perform a read ahead operation on the LUNs being accessed, which may improve performance in some environments. A value of on (true) will enable the read ahead operation. A value of off (false) will disable it. NOTE! This feature is disabled by default. Because of the way in which the array stores data on the disks, this feature may decrease performance in many environments. Before enabling this feature, contact HP support for assistance.
-pd {1GB|2GB} <*FruLocation*>	Set the port data rate to the value specified. <*FRULocation*> identifies the host port for which the data rate is being set. For example, to set the data rate for host port 1 on controller 2, enter M/C2.H1. NOTE! The disk port data rate cannot be changed on the VA 7410.
-pv <*value*> <*FruLocation*>	Sets the paging value of the VFP Serial Port. This controls the number of lines of output the VFP will generate before pausing and issuing a prompt to hit a key and accept more output. If this value is set to zero, paging is disabled and all output will be generated without breaks. This option is useful when using terminals with smaller screen sizes. <*FruLocation*> identifies the serial port and is of the form M/C1.VFP or M/C2.VFP.

-q <*value*> <*FruLocation*>	Set the Queue Full Threshold to <*value*>. For the VA 7400 and VA 7100 arrays, <*value*> must be in the range of 0 to Max Queue Threshold, which can be determined using the armdsp -s command. If "0" is used, it will set the Queue Full Threshold to its default value, which varies by firmware revision. For the VA 7110 and VA 7410 arrays, <*value*> must be in the range of 1 to Max Queue Threshold. There is no default value for these arrays. The Queue Full Threshold determines the size of the queue used to store host commands. When this value is reached, the array will return Queue Full status to subsequent host requests. Increasing the size of the queue may reduce the incidence of Queue Full status, but it may also result in longer response times because a command will have to sit in the queue longer before being serviced. If time-outs and long response times are occurring, it may be necessary to reduce the size of the queue. The <*FruLocation*> value is supported on HP15 firmware and later (VA7100/7400) and A000 or greater (VA7410/7110). On the VA 7410, it identifies the specific host port for which the Queue Full Threshold will be set. For example, to set the value for host port 1 on controller 2, enter M/C2.H1. On the VA 7100 and VA 7400 arrays, the <*FruLocation*> value is ignored and the threshold is set for all ports.
-r {on | off | true | false}	Change the apparent state of read cache on (true) or off (false). This switch only changes the read cache setting presented to the operating system and does not affect the operation of the array, which always has read cache enabled. This switch is provided for operating system interpretability.
-R [full | partial]	Perform either a full or partial reset of the array. If no parameter is supplied, a full reset is performed. Full reset can be used to reset the array in environments where the Fibre Channel Target Reset task management function is not possible. A full reset should also be used when the array is in an unknown state. A full reset includes memory tests. Partial reset can be used to reset the array in environments where the Fibre Channel Target Reset task management function is not possible. A partial reset does not include memory tests.
-s {shut | start}	Shutdown (shut) or restart (start) the array. A shutdown takes the array offline, making all data on the array unavailable to the host. A restart brings the array back online.

-S {on | off | true | false}	Disable secondary path information to the host. This option controls whether the array will make the non-optimal (secondary) path to LUNs visible to the hosts. A value of on (true) disables the secondary path. A value of off (false) enables it. NOTE! Disabling the secondary path impacts high-availability. The host cannot failover to the secondary path if the primary path is disrupted.
-t <*value*>	Set Capacity Threshold warning to the percentage specified by <*value*>. The capacity threshold warning generates an alert when the percentage of array capacity specified by <*value*> is in use.
-V {1 | 2}	Set Volume Set Revision. This value should be set to 1 on arrays with controller firmware versions HP13 and lower. It should be set to 2 for HP14 and greater. This setting is used when downloading firmware and is set automatically by the `armdownload` command.
-w {on | off | true | false}	Change the apparent state of write cache on (true) or off (false). This switch only changes the write cache setting presented to the operating system and does not affect the operation of the array, which always has write cache enabled. The array write cache is stored in NVRAM which eliminates the need to disable write cache for protection against power loss. This switch is provided for interpretability with those operating systems that require write cache be turned off.
-x {on | off | true | false}	Disable NVRAM on UPS absent. When set to on (true), NVRAM is disabled when no operational UPS is present and when set to off (false), NVRAM is enabled unless some other condition inhibits it.
Firmware HP11 and later: -y {private | public | fabric} <*FRULocation*> **Firmware HP01 and HP02:** -y {automatic | private | public | fabric} <*FRULocation*>	Set the topology for the controller host port to the specified value. <*FRULocation*> identifies the host port for which the topology is being set. For example, to set the topology for host port 1 on controller 2, enter M/C2.H1.
-?	Display extended help message.

Examples

Set port behavior for host port 2 on controller 1 to NetWare on array serial number 00786b5c0000.

```
armmgr -B NetWare M/C1.H2 00786b5c0000
```

Assign an alias of AutoRAID1 to array serial number 00USP1001087.

```
armmgr -D AutoRAID1 00USP1001087
```

Select RAID level 1+0 for array identified by device file /dev/dsk/c2t0d0.

```
armmgr -C raid1+0 /dev/dsk/c2t0d0
```

Identify disk 6 in disk enclosure 3 on FC loop 2 on array AutoRAID3 by flashing its LED.

```
armmgr -I JB3/D6 on AutoRAID3
```

armperf

Description

The `armperf` command displays array performance data.

Syntax

armperf {-c <*category*>} [-u <*unit*> [,<*unit*>, . . .]]
[-m "<*metric*> [,<*metric*>, . . .]"]
[-s <*starttime*>] [-e <*endtime*>]
[-n <*number of intervals*>] [-x *export_type*] <*array-id*>

armperf -i <*array-id*>
armperf -?

Options

-c <*category*>	Identifies the category for the specified metrics. Metrics are organized into four categories: LUN, ARRAY, DISK, or OPAQUE. Not all metrics are available for each category. The -i option described below indicates which metrics are available in each category. NOTE: The opaque metrics consist of data for internal controller policies and may not provide meaningful data for evaluating performance.
-u <*unit*> [<*unit*> . . .]	Used in conjunction with the category, the unit values identifies the LUN, disk, or controller (OPAQUE) for which metrics will be displayed. If not specified, metrics will be displayed for all units in the category. When specifying multiple units, separate each value with a comma.
-m "<*metric*> [,<*metric* . . .]"	Identifies the metrics to be displayed. Multiple metrics can be specified, separated with commas. The entire metric name list must be in enclosed in quotes. The -i option described below indicates which metrics are available in each category. The metrics are listed in Table 8.

-s *<starttime>*	The starting time of the range for which metrics will be displayed. Default is the earliest available record in the performance logs. Format of the time option: MMDDhhmm[YYYY] MM=month DD=day of month hh=hour in 24 hour format mm=minutes YYYY=year.
-e *<endtime>*	The end time of the range for which metrics will be displayed. Default is the latest available records in the performance logs. Format of the time option is identical to starttime.
-n *<number of intervals>*	Specifies the number of sampling intervals to use for a metric data average. The default is the sampling frequency of the performance software. A value less than or equal to one will use the default sample interval. A value greater than one will result in a metric data average for the number of intervals specified. For example, a value of 4 will result in a metric data average of every 4 sampling periods recorded by the performance software.
-x *export_type*	Exports the output in the specified format instead of a tabular output. The export types are: COMMA - comma separated list TAB - tab separated list SEMICOLON - semicolon separated list
-i	Lists all available performance metrics available for the array. The metrics are organized by category, and all units within each category are identified. The start and end times of available performance data for each unit is also listed. This option is used by itself and has no options.
-?	Display extended help message. Overrides all other switches.

Examples

List all available metric options and available LUNs on array alias Array1.

```
armperf -i Array1
```

Display the three LUN-based metrics identified by the -m option. Limit the display to the time period of August 5 from 7:00 am to 8:30 am on array with WWN 2002a00b880005c0.

```
armperf -c LUN -s 08050700 -e 0805830 -m "Host Reads,
Host Writes,Total I/O" 2002a00b880005c0
```

Performance Metrics

Table 8 lists the metrics maintained by the array. The categories for which each metric is available is identified. To determine which specific metrics are available for an array and each unit within the array, use the `armperf -i` command.

Note Not all the performance metrics listed here are available for display in the Command View SDM GUI.

The performance metrics are retrieved from the array once every polling interval. The polling interval is set to 15 minutes by default but can be reconfigured. The values of the performance metrics are reported as the incremental change that occurred during the polling interval (unless identified as "absolute"). Any metrics that measure rates or throughputs measure the average rate or throughput that occurred during the polling interval (unless otherwise noted).

A single performance metric can be reported for more than one category. The categories for which metrics can be reported are ARRAY, LUN, DISK, FRONTEND-PORT, BACKEND-PORT, and OPAQUE (controller). Unless otherwise noted, values reported for the ARRAY category are computed as a sum of the corresponding values for the constituent components. For example, the Host Reads metric reported for the ARRAY category would be the sum of the Host Reads metric for each configured LUN in the array.

There are some common units of measure referenced by the performance metrics:

- logical block = 512 bytes
- cache page size = 64 Kbytes = 128 logical blocks
- cluster size = 256 Kbytes = 512 logical blocks

Note In some cases metric names and categories are different in the 1.05 release of Command View SDM or are different for each product. These differences are identified

Table 8 Performance Metrics

Metric	Categories	Description/Usage
1 Hour Write Working Set 11 Hour Write Working Set 24 Hour Write Working Set	ARRAY OPAQUE	The number of clusters that have been written approximately within the time frame specified by the metric. **Usage** AutoRAID attempts to keep the write working set in RAID 1+0 storage to provide the best random write performance. These metrics are used by AutoRAID to implement that policy.
Actual Temperature	DISK-PORTS	The temperature sensed in the disk at the time the Log Sense command is performed, given in degrees Celsius **Usage** The comparison of the Actual Temperature with the Maximum Operating Temperature indicates how close the drive is to its operational limits.
Cache Pages Read	ARRAY LUN	The number of disk read commands used to partially or fully fill read cache pages in response to host read commands. Each disk read used to fill a read cache page is counted as one cache page read independent of the portion of a read cache page that it fills and independent of whether the read cache page previously held cached read data. Disk reads generated by array internal policy operation are not counted as cache pages read. **Usage** The ratio of Read Cache Hits to (Read Cache Hits + Cache Pages Read) gives a general indication of the effectiveness of the read cache in servicing the host read workload. Effectiveness is approximately proportional to the ratio.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Cache Pages Written	ARRAY LUN	The number of write cache pages written to disk in response to host write commands. Each write cache page is counted as a single cache page written independent of the number of disk write commands used to write the page. Disk writes generated by array internal policy operation are not counted as cache pages written. **Usage** The ratio of Write Cache Hits to Cache Pages Written gives a general indication of the effectiveness of the write cache in servicing the host write workload. The write cache serves primarily as a buffer to absorb bursts of high write activity in the host workload and provide a low latency response then write the data to disk during a time of lower activity. All data that comes into the write cache will eventually be written to disk. If this ratio is near one that is an indication that there is an approximate one to one correspondence between incoming and outgoing writes. In that case a high percentage of the incoming writes will have a low latency response. If this ratio is larger than one the write cache is providing an additional benefit of combining multiple incoming writes into a single disk write. If this ratio is less than one a percentage of incoming writes related to the value of the ratio will not be receiving a low latency response.
Clusters Relocated	ARRAY OPAQUE	The number of clusters relocated. **Usage** There are a number of different processes that can cause data migration both in foreground and background. This metric is an over all measure of the amount of work being performed for migration. Some migration activity is only performed in background as idle time is available and so does not interfere with processing of the host workload. Other migration activity is performed in foreground and consumes resources that might otherwise be used to service the host workload. This metric does not provide a means to distinguish the type of migration taking place and so is not a reliable indicator of the performance impact of migration.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Command Aborts Received (1.05 release) Abort Sequences Received (prior to 1.05)	OPAQUE (7100/ 7400/7110) FRONTEND-PORT (7410)	The number of SCSI abort requests received. **Usage** This metric can be compared with the "Command Frames Received" and "Queue Full Statuses Sent" metrics to see if there is a significant issue in the current operation of the array. If Queue Full or Abort is more than a very minor portion of the commands being received, then there is a problem that needs to be addressed.
Command Frames Received	OPAQUE (7100/ 7400/7110) FRONTEND-PORT (7410)	The number of SCSI commands received. **Usage** This includes all commands not just the read and write commands. This metric can be compared with the "Queue Full Statuses Sent" and "Abort Sequences Received" metrics to see if there is a significant issue in the current operation of the array. If Queue Full or Abort is more than a very minor portion of the commands being received, then there is a problem that needs to be addressed.
Commands Timed Out	BACKEND-PORT	The number of commands to targets on the back end loop that were aborted before they completed due to excessive execution time. **Usage** A high number of back end aborts may effect performance and may be an indication that hardware repair is needed. **Compatibility** BACKEND-PORT metrics are available for VA 7410 only.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Corrected Read Errors Without Delay	DISK-PORTS	An error correction was applied to get perfect data (like ECC on-the-fly). "Without substantial delay" means the correction did not postpone reading of later sectors (e.g., a revolution was not lost). The counter is incremented once for each logical block that requires correction. Two different blocks corrected during the same command are counted as two events **Usage** Each of the read error counters provides a general indication of the quality of read operations. Any significant counts in any of the read error counters is an indication that drive operational quality may be having an effect on performance.
Corrected Read Errors With Delay	DISK-PORTS	An error code or algorithm (e.g., ECC, checksum) is applied in order to get perfect data with substantial delay. "With possible delay" means the correction took longer than a sector time so that writing of subsequent sectors was delayed (e.g., a lost revolution). The counter is incremented once for each logical block that requires correction. A block with a double error that is correctable counts as one event and two different blocks corrected during the same command count as two events. **Usage** Each of the read error counters provides a general indication of the quality of read operations. Any significant counts in any of the read error counters is an indication that drive operational quality may be having an effect on performance.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Corrected Read Errors With Retry	DISK-PORTS	Specifies the counter counting the number of errors that are corrected by applying retries. This counts errors recovered, not the number of retries. If five retries were required to recover one block of data, the counter increments by one, not five. The counter is incremented once for each logical block that is recovered using retries. If an error is not recoverable while applying retries and is recovered by ECC, it isn't counted by this counter; it will be counted by the counter "Corrected Read Errors With Delay". **Usage** Each of the read error counters provides a general indication of the quality of read operations. Any significant counts in any of the read error counters is an indication that drive operational quality may be having an effect on performance.
Corrected Write Errors With Delay	DISK-PORTS	An error code or algorithm (e.g., ECC, checksum) is applied in order to get perfect data with substantial delay. "With possible delay" means the correction took longer than a sector time so that writing of subsequent sectors was delayed (e.g., a lost revolution). The counter is incremented once for each logical block that requires correction. A block with a double error that is correctable counts as one event and two different blocks corrected during the same command count as two events. **Usage** Each of the write error counters provides a general indication of the quality of write operations. Any significant counts in any of the write error counters is an indication that drive operational quality may be having an effect on performance.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Corrected Write Errors With Retry	DISK-PORTS	Specifies the counter counting the number of errors that are corrected by applying retries. This counts errors recovered, not the number of retries. If five retries were required to recover one block of data, the counter increments by one, not five. The counter is incremented once for each logical block that is recovered using retries. If an error is not recoverable while applying retries and is recovered by ECC, it isn't counted by this counter; it will be counted by the counter "Corrected Write Errors With Delay". **Usage** Each of the write error counters provides a general indication of the quality of write operations. Any significant counts in any of the write error counters is an indication that drive operational quality may be having an effect on performance.
Discarded Frame Count	FRONTEND-PORT, BACKEND-PORT	The number of frames received and discarded for any of the following reasons: - Bad CRC with EOFdti or EOFni delimiter - Code violation (invalid character or running disparity) - EOFdti or EOFni - Fill byte error - Frame smaller than 24 bytes - First frame of a link down - Payload larger than 1024 bytes - Unexpected K character **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT metrics are available for VA 7410 only.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Host Reads	ARRAY LUN	The total number of host read commands completed. **Usage** This metric is used as the basis to compute the Read Rate metric. It can be used along with the Host Writes metric to determine the read/write ratio characteristic of the workload.
Host Writes	ARRAY LUN	The total number of host write commands completed. **Usage** This metric is used as the basis to compute the Write Rate metric. It can be used along with the Host Reads metric to determine the read/write ratio characteristic of the workload.
Invalid CRC Count	FRONTEND-PORT, BACKEND-PORT	The number of frames received having an EOF indicating valid frame contents but having an invalid CRC. Frames ending with an EOF indicating invalid frames contents (EOFa, EOFni, EOFdti) are not counted. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT are available for VA 7410 only.
Invalid Transmission Word Count	FRONTEND-PORT, BACKEND-PORT	The number of invalid transmission words received. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT are available for VA 7410 only.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Link Failure Count	FRONTEND-PORT, BACKEND-PORT	The number of times a NOS primitive sequence or another failure of N_Port initialization protocol caused a transition into the link failure state. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT are available for VA 7410 only.
Logical Blocks Read	ARRAY LUN	The total number of logical blocks transferred by host read commands. **Usage** This metric is used as the basis to compute the Logical Blocks Read Rate metric. In combination with the Host Reads metric this metric can be used to determine the average size of read commands in the host read workload.
Logical Blocks Read Rate (1.05 release) Logical Blocks Read Throughput (prior to 1.05)	ARRAY LUN	The average number of logical blocks transferred per second by read commands. **Usage** This metric is a measure of the performance level being achieved for reads and also provides some indication of the demand level of the host workload. High read throughput will not be achieved when the workload demand is low.
Logical Blocks Written	ARRAY LUN	The total number of logical blocks transferred by host write commands. **Usage** This metric is used as the basis to compute the Logical Blocks Written Rate metric. In combination with the Host Writes metric this metric can be used to determine the average size of write commands in the host write workload.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Logical Blocks Written Rate (1.05 release) Logical Blocks Written Throughput (prior to 1.05)	ARRAY LUN	The average number of logical blocks transferred per second by write commands. **Usage** This metric is a measure of the performance level being achieved for writes and also provides some indication of the demand level of the host workload. High write rate will not be achieved when the workload demand is low.
Loss of Signal Count	FRONTEND-PORT, BACKEND-PORT	The number of times a loss of signal was detected. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT metrics are available for VA 7410 only.
Loss of Sync Count	FRONTEND-PORT, BACKEND-PORT	The number of times a loss of synchronization was detected. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT metrics are available for VA 7410 only.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Make Space For Write Invocations	OPAQUE	The number of times the make space policy has been invoked. **Usage** The make space policy runs only in foreground on demand when free disk space is needed to post data from the write cache so that space can be freed up in the write cache to process host write commands. This can cause a significant delay in processing of the host write commands that are waiting. Even one invocation of the make space policy can potentially cause a noticeable performance degradation. As the array comes close to running out of free disk space the optimize policy switches from its normal mode into a priority mode to make free disk space in an attempt to avoid invocation of the make space policy. Each invocation of the make space policy is an indication that data was migrated to make more free disk space. An array that is experiencing a relatively high rate of make space invocations will very likely be achieving unacceptably low performance levels.
Maximum Operating Temperature	DISK-PORTS	The maximum reported sensor temperature in degrees Celsius at which the drive will operate continuously without degrading the drives operation or reliability outside the limits specified by the manufacturer of the drive **Usage** The comparison of the Actual Temperature with the Maximum Operating Temperature indicates how close the drive is to its operational limits.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
New RAID 1+0 Writes	OPAQUE	The number of write operations to previously unwritten LUN addresses posted out of the write cache to RAID 1+0 storage. **Usage** New writes are host writes to LUN addresses that have not been written since the LUN was created. AutoRAID will decide whether to place write data into RAID 1+0 or RAID 5 DP storage when it is posted out of the write cache. When RAID 1+0 is the destination for a new write, the space allocation can be fulfilled by creating a new RAID 1+0 storage area or by selecting free space in an existing RAID 1+0 storage area. A large number of new writes such as may occur when loading data onto a newly created LUN can cause free disk space to be consumed rapidly leading to possible invocation of the make space policy and the associated performance impacts. AutoRAID attempts to detect the data load scenario and direct new writes to RAID 5 DP storage so as to conserve free disk space in that case.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
New RAID 5 DP Writes	OPAQUE	The number of write operations to RAID 5 DP storage that caused allocation of new space in RAID 5 DP. **Usage** New writes are host writes to LUN addresses that have not been written since the LUN was created. Rewrites are host writes to LUN addresses that have already been written at least once since the LUN was created. AutoRAID will decide whether to place write data into RAID 1+0 or RAID 5 DP storage when it is posted out of the write cache. Relocations are movements of data currently stored in the array from one location to another. All of these types of write operations can cause allocation of new space in RAID 5 DP storage and so are counted by this metric. A large number of these allocating writes such as may occur when loading data onto a newly created LUN or when a rebuild operation is taking place can cause free disk space to be consumed rapidly leading to possible invocation of the make space policy and the associated performance impacts. AutoRAID attempts to detect the data load scenario and direct new writes to RAID 5 DP storage so as to conserve free disk space in that case.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Number of Forced Unit Access Commands	ARRAY LUN	The number of host read and write commands processed while the Forced Unit Access condition was in effect. When the Forced Unit Access condition is in effect for a read command, any data in the read cache addressed by the read command is discarded and fetched from disk again. When the Forced Unit Access condition is in effect for a write command, any data in the write cache for the LUN addressed by the write command is posted to disk before the write command is processed. When the write command is processed it is posted to disk before completion status is reported to the host. The table below indicates when the Forced Unit Access condition is in effect. **Usage** Normally read commands that address data completely contained in the read cache will be satisfied by reading the data from the read cache rather than from disk. Normally write commands will report completion after the write data has been placed into the write cache and before it is written to disk. The Forced Unit Access condition causes host reads to be satisfied from disk and host writes to be written to disk before completion is reported to the host. Operating in Forced Unit Access mode can significantly reduce performance, especially for writes.

		Firmware releases HP13 and prior	Firmware releases after HP13
Array mode	FUA requested in read or write command?	FUA in effect?	FUA in effect?
Normal	No	No	No
Normal	Yes	Yes	No
Extended Normal	No	No	No
Extended Normal	Yes	Yes	Yes
Secure	N/A	Yes	Yes

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Optimize Invocations	OPAQUE	The number of times the optimize policy has been invoked. **Usage** The optimize policy runs only in background when idle time is available in the array. It attempts to keep the array operating optimally by keeping the write working set in RAID 1+0 storage and by maintaining a minimum threshold of free disk space. The optimize policy does not necessarily do any optimization work when it is invoked but this is still counted as an invocation. This metric will have a non-zero value on an array that has idle time even though the array may already be fully optimized. Actual optimization activity occurring is measured by the Relocations Spawned by Optimize metrics. A relative comparison between invocations and relocations indicate scenarios as described in the table below. In some cases multiple scenarios are possible. The optimize policy can operate in either a normal or a priority mode. It will enter the priority mode when the array is critically low on free space in an attempt to avoid use of the make space policy.

Table 8 Performance Metrics (Continued)

Metric		Categories	Description/Usage
Relative values of metrics		**Possible scenarios**	
Invocations	**Relocations**		
High	High		The array has idle time available for optimization and optimization is occurring.
High	Low		The array has enough idle time to allow the optimize policy to be invoked but not enough idle time to allow optimization work to make progress. The optimization work is being pre-empted to service the host workload or to run a higher priority policy like make space or rebuild.
High	Low		The array has enough idle time to allow the optimize policy to be invoked but there is no optimization work to do. The array is already fully optimized.
Low	Low		The array has idle time available for optimization and optimization is occurring but the optimize policy is spending a relatively large amount of time searching for optimization work to do.
Low	Low		The array is so busy that the optimize policy is not being invoked very often.
Low	High		The array has idle time available for optimization and optimization is occurring. Each invocation of the optimize policy is resulting in a relatively large amount of optimization work being accomplished. The amount of optimization work is preventing the optimize policy from being invoked more frequently.
Port-A Loss of Sync Count		DISK-PORTS	Number of short (< 100 msecs) Loss of Synchronization conditions that have occurred on Port A. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.
Port-A Invalid Transmission Word Count		DISK-PORTS	Count of the number of invalid transmission words/ Running Disparity errors that have been detected on Port A **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Port-A Invalid CRC Count	DISK-PORTS	Count of the number of write data frames that have been received with invalid CRCs on Port A. These errors are only detected when this drive is the target of the data transfer **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.
Port-A Link Failure Count	DISK-PORTS	Number of Loss of Sync conditions that have occurred on Port A which exceeded 100 msecs in duration **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.
Port-B Loss of Sync Count	DISK-PORTS	Number of short (< 100 msecs) Loss of Synchronization conditions that have occurred on Port B. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.
Port-B Invalid Transmission Word Count	DISK-PORTS	Count of the number of invalid transmission words/ Running Disparity errors that have been detected on Port B **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Port-B Invalid CRC Count	DISK-PORTS	Count of the number of write data frames that have been received with invalid CRCs on Port B. These errors are only detected when this drive is the target of the data transfer **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.
Port-B Link Failure Count	DISK-PORTS	Number of Loss of Sync conditions that have occurred on Port B which exceeded 100 msecs in duration **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance.
Primitive Sequence Count	FRONTEND-PORT, BACKEND-PORT	The number of frames received with an EOFa delimiter regardless of frame CRC validity. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT metrics are available for VA 7410 only.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Protocol Error Count	FRONTEND-PORT, BACKEND-PORT	The number of N_Port protocol errors detected and LRR primitive sequences received while the link was up. **Usage** Each of the port error counters provides a general indication of the quality of port operation. Any significant counts in any of the port error counters is an indication that port or link operational quality may be having an effect on performance. **Compatibility** FRONTEND-PORT metrics are available for all products. BACKEND-PORT metrics are available for VA 7410 only.
Queue Full Statuses Sent (1.05 release) Queue Full Response (prior to 1.05)	ARRAY (7100/ 7400/7110) OPAQUE FRONTEND-PORT (7410)	The number of commands that were failed with a SCSI status of "Queue Full." **Usage** The Queue Full status indicates that the array is completely full of work and cannot accept any more commands. A large number of Queue Full statuses is an indication that the array is not configured to effectively manage the host workload. In this case users may be experiencing unacceptably long response time when attempting to access data on the array. If possible, adding more disks to the array may help to improve response time.
RAID 1+0 Allocation (absolute)	LUN	The number of logical blocks in the LUN that are stored using the RAID 1+0 storage method. **Usage** RAID 1+0 provides better random write performance than RAID 5 DP. The more data stored in RAID 1+0 as compared to RAID 5 DP, the better the random write performance that can be achieved. This metric combined with the RAID 5 DP Allocation metric for a LUN will indicate the class of random write performance that can be expected from the LUN. Some LUN's in an AutoRAID configuration may be almost completely stored as RAID 1+0 if the data stored in the LUN is mostly within the write working set.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
RAID 1+0 Writes in Place	OPAQUE	The number of write operations to previously written LUN addresses posted out of the write cache to RAID 1+0 storage. **Usage** Rewrites are host writes to LUN addresses that have already been written at least once since the LUN was created. AutoRAID will decide whether to place write data into RAID 1+0 or RAID 5 DP storage when it is posted out of the write cache. When RAID 1+0 is the destination for a rewrite, it will be performed by updating the data in place rather than relocating the cluster containing the data. This provides the performance benefit of AutoRAID for random writes by keeping the write working set in RAID 1+0 storage. Random write performance will be optimized when the majority of random writes occur as RAID 1+0 writes in place.
RAID 5 DP Allocation (absolute)	LUN	The number of logical blocks in the LUN that are stored using the RAID 5 DP storage method. **Usage** RAID 5 DP provides better storage efficiency than RAID 1+0 and approximately equivalent sequential write performance. AutoRAID will attempt to detect a sequential write workload and store the data in RAID 5 DP to get better storage efficiency. As the array becomes filled with data AutoRAID will migrate more of the data to RAID 5 DP. AutoRAID preserves a minimum of 10% of the data in RAID 1+0 when the array is completely full. This metric combined with the RAID 1+0 Allocation metric for a LUN will indicate the class of random write performance that can be expected from the LUN. If the LUN does not contain much of the write working set, the data in the LUN may be almost completely stored as RAID 5 DP.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
RAID 1+0 Allocation (1.05 release) RAID 1+0 Capacity (absolute) (prior to 1.05)	ARRAY	The number of logical blocks in the array that are stored using the RAID 1+0 storage method. It is a sum of the RAID 1+0 Allocation metrics from each configured LUN. **Usage** RAID 1+0 provides better random write performance than RAID 5 DP. The more data stored in RAID 1+0 as compared to RAID 5 DP, the better the random write performance that can be achieved. AutoRAID policies will migrate the write working set into RAID 1+0 for better random write performance. If better random write performance is needed in an AutoRAID configuration, adding more disks to the array may provide enough space to fit the write working set into RAID 1+0 providing better random write performance. This metric can be compared with the RAID 5 DP Allocation metric to determine the overall distribution of data across the two storage methods. Space that has been allocated to configured LUN's but has not been written to yet will not be counted in either the RAID 1+0 Allocation or the RAID 5 DP Allocation metrics. The sum of these two metrics can be compared to the total capacity allocated to configured LUN's to determine how "full" the array is.
RAID 1+0 to RAID 1+0 Relocations Spawned by MakeSpace	OPAQUE	The number of clusters that were relocated by the make space policy from RAID 1+0 to RAID 1+0 storage. **Usage** The RAID 1+0 storage areas can become filled with holes of empty space similar to the RAID 5 DP storage areas (reference the "RAID 5 DP to RAID 5 DP Relocations Spawned by MakeSpace" metric). The RAID 1+0 holes do not need to be garbage collected to turn them into usable free space. Data from the write cache can be posted directly into RAID 1+0 holes. Therefore, RAID 1+0 to RAID 1+0 relocations are not ever expected to be spawned by the make space policy. This metric will always have the value zero except under unforeseen circumstances.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
RAID 1+0 to RAID 5 DP Relocations Spawned by MakeSpace	OPAQUE	The number of clusters that were relocated by the make space policy from RAID 1+0 to RAID 5 DP storage. **Usage** RAID 5 DP provides better storage efficiency than RAID 1+0. If more free space cannot be obtained by garbage collecting holes in RAID 5 DP storage areas (reference the "RAID 5 DP to RAID 5 DP Relocations Spawned by MakeSpace" metric) and there are no holes available to post write cache data in RAID 1+0 storage areas (reference the "RAID 1+0 to RAID 1+0 Relocations Spawned by MakeSpace" metric) and there is no unallocated free space available, then the make space policy will move data from RAID 1+0 to RAID 5 DP to make more free space. Unlike the optimize policy, the make space policy does not discriminate by the recency of writing when selecting data to be relocated from RAID 1+0 to RAID 5 DP. Since the make space policy only runs when host writes are waiting to be completed, there is no time available to locate the least recently written data.
RAID 1+0 to RAID 1+0 Relocations Spawned by Optimize	OPAQUE	The number of clusters that were relocated by the optimize policy from RAID 1+0 to RAID 1+0 storage. **Usage** The RAID 1+0 storage areas can become filled with holes of empty space that need to be garbage collected to make the space available as free space. These relocations are used to do garbage collection in the RAID 1+0 storage areas.
RAID 1+0 to RAID 5 DP Relocations Spawned by Optimize	OPAQUE	The number of clusters that were relocated by the optimize policy from RAID 1+0 to RAID 5 DP storage. **Usage** Optimize uses these relocations to move the least recently written data to RAID 5 DP storage so there is space available in RAID 1+0 storage for the write working set (reference the RAID 5 DP to RAID 1+0 DP Relocations Spawned by Optimize metric).

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
RAID 5 DP Allocation (1.05 release) RAID 5 DP Capacity (absolute) (prior to 1.05)	ARRAY	The number of logical blocks in the array that are stored using the RAID 5 DP storage method. It is a sum of the RAID 5 DP Allocation metrics from each configured LUN. **Usage** RAID 5 DP provides better storage efficiency than RAID 1+0 and approximately equivalent sequential write performance. AutoRAID will attempt to detect a sequential write workload and store the data in RAID 5 DP to get better storage efficiency. As the array becomes filled with data AutoRAID will migrate more of the data to RAID 5 DP. AutoRAID preserves a minimum of 10% of the data in RAID 1+0 when the array is completely full. The more data stored in RAID 1+0 as compared to RAID 5 DP, the better the random write performance that can be achieved. AutoRAID policies will migrate the write working set into RAID 1+0 for better random write performance. If better random write performance is needed in an AutoRAID configuration, adding more disks to the array may provide enough space to fit the write working set into RAID 1+0 providing better random write performance. This metric can be compared with the RAID 1+0 DP Capacity metric to determine the overall distribution of data across the two storage methods. Space that has been allocated to configured LUN's but has not been written to yet will not be counted in either the RAID 5 DP Allocation or the RAID 1+0 DP Capacity metrics. The sum of these two metrics can be compared to the total capacity allocated to configured LUN's to determine how "full" the array is.
RAID 5 DP to RAID 1+0 Relocations Spawned by MakeSpace	OPAQUE	The number of clusters that were relocated by the make space policy from RAID 5 DP to RAID 1+0 storage. **Usage** RAID 1+0 has less storage efficiency than RAID 5 DP so relocating data from RAID 1+0 to RAID 5 DP does not contribute to the goal of the make space policy. One of these relocations may occur in the case that a RAID 5 DP to RAID 5 DP relocation was interrupted by an error.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
RAID 5 DP to RAID 5 DP Relocations Spawned by MakeSpace	OPAQUE	The number of clusters that were relocated by the make space policy from RAID 5 DP to RAID 5 DP storage. **Usage** The RAID 5 DP storage areas can become filled with holes of empty space that need to be garbage collected to make the space available as free space for write data posted from the write cache. These relocations are used to do garbage collection in the RAID 5 DP storage areas. This is the method most highly preferred by the make space policy for making free space.
RAID 5 DP to RAID 1+0 Relocations Spawned by Optimize	OPAQUE	The number of clusters that were relocated by the optimize policy from RAID 5 DP to RAID 1+0 storage. **Usage** Optimize uses these relocations to move the write working set into RAID 1+0 storage to optimize random write performance.
RAID 5 DP to RAID 5 DP Relocations Spawned by Optimize	OPAQUE	The number of clusters that were relocated by the optimize policy from RAID 5 DP to RAID 5 DP storage. **Usage** The RAID 5 DP storage areas can become filled with holes of empty space that need to be garbage collected to make the space available as free space. These relocations are used to do garbage collection in the RAID 5 DP storage areas.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
RAID 5 DP Writes in Place	OPAQUE	The number of write operations to previously written LUN addresses posted out of the write cache to RAID 5 DP storage. **Usage** Rewrites are host writes to LUN addresses that have already been written at least once since the LUN was created. AutoRAID will decide whether to place write data into RAID 1+0 or RAID 5 DP storage when it is posted out of the write cache. When RAID 5 DP is the destination for a rewrite, the data may be written in place in RAID 5 DP by the conventional read, modify, write process or it may be written by relocating the cluster containing the data. This metric counts only those writes to RAID 5 DP that use the read, modify, write process. Writes to RAID 5 DP that use relocation are counted by the New RAID 5 DP Writes metric. A relatively large number of RAID 5 DP writes in place as compared to RAID 1+0 writes in place may be an indication that random write performance is being limited because there isn't enough disk space for the write working set to fit in RAID 1+0 storage. In this case it may be possible to improve random write performance by adding more disks to the array.
Read Cache Hits	ARRAY LUN	The number of cache page accesses that were satisfied immediately from data that was stored in the read or write cache when processing host read commands. A host read command that spans multiple read cache pages will count a read cache hit for each read cache page that was immediately available in the read cache when the read command was processed. Any delays in accessing cache pages due to read cache fetches, write cache posts or due to address conflicts with data in the cache being read or written to disk will not be counted as a read cache hit. **Usage** The ratio of Read Cache Hits to (Read Cache Hits + Cache Pages Read) gives a general indication of the effectiveness of the read cache in servicing the host read workload. Effectiveness is approximately proportional to the ratio.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Read Cache Size (absolute)	ARRAY	The capacity of memory allocated to the read cache (in Kbytes). **Usage** The capacity of the read cache is based on the amount of memory installed in the controllers. If other metrics indicate the read cache is not effectively servicing the host read workload, it may be possible to increase performance by installing more controller memory.
Read Commands	DISK	The number of read commands issued to the disk. **Usage** This metric for all the disks can be compared to determine if there is an imbalance in the workload that is causing a single disk or a small set of disks to be a performance limitation. The array attempts to spread the workload evenly across all the disks but certain workload patterns could possibly defeat this process.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Read Command Latency *range*	ARRAY LUN	The number of read commands that were received and completed within the time range specified by the metric. The supported time ranges are: 0-2.55 ms 2.56-5.11 ms 5.12-10.23 ms 10.24-20.47 ms 20.48-40.95 ms 40.96-81.91 ms 81.92-163.83 ms 163.84-327.67 ms 327.68-655.35 ms >655.35 ms The following additional time ranges are supported only on VA 7410: 655.36ms-1.30S 1.31-2.61S 2.62-5.23S 5.24-10.47S 10.48-20.95S 20.96-41.91S 41.92-83.83S 83.84-167.67S >167.68S **Usage** This set of metrics provides a summary of the response time performance being achieved for read commands. The measured latency for a command includes all delays that occur during the processing of the command both inside and outside the array. If significant host channel delays are being encountered, they cannot be separated from the internal array processing time of a command by this set of metrics. In this case this set of metrics may not accurately reflect the performance capability of the array. The latency is measured from the time the command is received by the array through the completion of the data transfer for the command. The time required for command status transfer is not included.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Read ECC Usage	DISK-PORTS	Specifies the counter that counts the total number of retries of the number of times the retry algorithm is invoked. If after five attempts an error of type "Corrected Read Error With Retry" is recovered, then five is added to this counter. If three retries are required to get a stable ECC syndrome before an error of type "Corrected Read Errors With Delay" is corrected, then those three retries are also counted here. The number of retries applied to unsuccessfully recover an error of type "Total Uncorrected Read Errors" are also counted by this counter. **Usage** Each of the read error counters provides a general indication of the quality of read operations. Any significant counts in any of the read error counters is an indication that drive operational quality may be having an effect on performance.
Read Rate (1.05 release) Read Throughput (prior to 1.05)	ARRAY LUN	The average number of host read commands completed per second. **Usage** This metric is a measure of the performance level being achieved for reads and also provides some indication of the demand level of the host workload. High read rates will not be achieved when the workload demand is low.
Read Throughput (1.05 release) MBytes Read Throughput (prior to 1.05)	ARRAY LUN	The average number of megabytes transferred per second by read commands. **Usage** This metric is a measure of the performance level being achieved for reads and also provides some indication of the demand level of the host workload. High read throughput will not be achieved when the workload demand is low. This metric is computed from the Logical Blocks Read Rate by converting logical blocks to megabytes. The conversion factor is 2048 blocks per megabyte.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Total Cache Pages Accessed	ARRAY LUN	The total number of disk read and write commands used to fetch and post data to and from the read and write caches. It is a sum of the Cache Pages Read and Cache Pages Written metrics. See the descriptions of those two metrics for more detailed information. Disk read and writes generated by array internal policy operation are not counted as cache pages accessed. **Usage** The read and write caches employ different caching policies so it is not very meaningful to analyze the combined read and write cache effectiveness. See usage information on the individual read and write cache metrics for more information on analyzing cache effectiveness.
Total Corrected Read Errors	DISK-PORTS	The total of all correctable errors encountered. It is the sum of the counters specified by "Corrected Read Errors With Possible Delay" and "Corrected Read Errors With Retry". There is no double counting of data errors among these two counters and all correctable data errors are counted in one of these counters. **Usage** Each of the write error counters provides a general indication of the quality of write operations. Any significant counts in any of the write error counters is an indication that drive operational quality may be having an effect on performance.
Total Corrected Write Errors	DISK-PORTS	The total of all correctable errors encountered. It is the sum of the counters specified by "Corrected Write Errors With Possible Delay" and "Corrected Write Errors With Retry". There is no double counting of data errors among these two counters and all correctable data errors are counted in one of these counters **Usage** Each of the write error counters provides a general indication of the quality of write operations. Any significant counts in any of the write error counters is an indication that drive operational quality may be having an effect on performance.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Total I/O	ARRAY LUN	The total number of host read and write commands completed. **Usage** This metric is used as the basis to compute the Total I/O Rate metric.
Total I/O Rate (1.05 release) Total I/O Throughput (prior to 1.05)	ARRAY LUN	The average number of host read and write commands completed per second. **Usage** This metric is a measure of the performance level being achieved and also provides some indication of the demand level of the host workload. High total I/O rates will not be achieved when the workload demand is low.
Total I/O Throughput (1.05 release) MBytes Total Read/Write Throughput (prior to 1.05)	ARRAY LUN	The average number of megabytes transferred per second by read and write commands. **Usage** This metric is a measure of the performance level being achieved by the array also provides some indication of the demand level of the host workload. High total throughput will not be achieved when the workload demand is low. This metric is computed from the Total Logical Blocks Transferred Rate by converting logical blocks to megabytes. The conversion factor is 2048 blocks per megabyte.
Total Logical Blocks Transferred	ARRAY LUN	The total number of logical blocks transferred by host read and write commands. **Usage** This metric is used as the basis to compute the Total Logical Blocks Transferred Rate metric. In combination with the Total I/O metric this metric can be used to determine the average size of read and write commands in the host workload.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Total Logical Blocks Transferred Rate (release 1.05) Total Logical Blocks Throughput (prior to 1.05)	ARRAY LUN	The average number of logical blocks transferred per second by read and write commands. **Usage** This metric is a measure of the performance level being achieved by the array and also provides some indication of the demand level of the host workload. High total throughput will not be achieved when the workload demand is low
Total Mbytes Read	DISK-PORTS	The total number of bytes either successfully or unsuccessfully written to the drive. If a transfer terminates early because of an unrecoverable error, only the logical blocks up to and including the one with the unrecoverable error are counted. **Usage** Indicates the amount of read activity for this drive. This metric for all the disks can be compared to determine if there is an imbalance in the workload that is causing a single disk or a small set of disks to be a performance limitation. The array attempts to spread the workload evenly across all the disks but certain workload patterns could possibly defeat this process.
Total Mbytes Written	DISK-PORTS	The total number of bytes either successfully or unsuccessfully written to the drive. If a transfer terminates early because of an unrecoverable error, only the logical blocks up to and including the one with the unrecoverable error are counted. **Usage** Indicates the amount of write activity for this drive. This metric for all the disks can be compared to determine if there is an imbalance in the workload that is causing a single disk or a small set of disks to be a performance limitation. The array attempts to spread the workload evenly across all the disks but certain workload patterns could possibly defeat this process.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Total Uncorrected Read Errors	DISK-PORTS	The total number of blocks for which an unrecoverable data error has occurred. **Usage** Each of the read error counters provides a general indication of the quality of read operations. Any significant counts in any of the read error counters is an indication that drive operational quality may be having an effect on performance.
Total Uncorrected Write Errors	DISK-PORTS	The total number of blocks for which an unrecoverable data error has occurred. **Usage** Each of the write error counters provides a general indication of the quality of write operations. Any significant counts in any of the write error counters is an indication that drive operational quality may be having an effect on performance.
Transfer Length *range*	ARRAY LUN	The number of read and write commands completed whose data transfer lengths fall within the length range specified by the metric. The data transfer lengths are specified in bytes. The supported length ranges are: 0-2047 bytes 2048-4095 bytes 4096-8191 bytes 8192-16383 bytes 16384-32767 bytes 32768-65535 bytes 65536-131071 bytes 131072-262143 bytes >262143 bytes **Usage** This set of metrics provides a summary of the data transfer length characteristics of the host workload. This information can be useful in determining expected performance levels and in discovering possible performance optimizations for the array and for the system it is configured into.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Write Cache Hits	ARRAY LUN	The number of cache page accesses that were satisfied immediately from data that was stored in the write cache when processing host write commands. A host write command that spans multiple write cache pages will count a write cache hit for each write cache page that was immediately available in the write cache when the write command was processed. Any delays in accessing cache pages due to write cache posts or due to address conflicts with data in the cache being read or written to disk will not be counted as a write cache hit. A cache page access that causes the allocation of a new write cache page from the pool of free write cache pages without waiting for a write cache post to complete is counted as a write cache hit. **Usage** The ratio of Write Cache Hits to Cache Pages Written gives a general indication of the effectiveness of the write cache in servicing the host write workload. The write cache serves primarily as a buffer to absorb bursts of high write activity in the host workload and provide a low latency response then write the data to disk during a time of lower activity. All data that comes into the write cache will eventually be written to disk. If this ratio is near one that is an indication that there is an approximate one to one correspondence between incoming and outgoing writes. In that case a high percentage of the incoming writes will have a low latency response. If this ratio is larger than one the write cache is providing an additional benefit of combining multiple incoming writes into a single disk write. If this ratio is less than one a percentage of incoming writes related to the value of the ratio will not be receiving a low latency response.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Write Cache Size (absolute)	ARRAY	The capacity of memory allocated to the write cache (in Kbytes). The write cache memory is non-volatile and mirrored between the dual controllers. **Usage** The capacity of the write cache is based on the amount of memory installed in the controllers. If other metrics indicate the write cache is not effectively servicing the host write workload, it may be possible to increase performance by installing more controller memory.
Write commands	DISK	The number of read commands issued to the disk. **Usage** This metric for all the disks can be compared to determine if there is an imbalance in the workload that is causing a single disk or a small set of disks to be a performance limitation. The array attempts to spread the workload evenly across all the disks but certain workload patterns could possibly defeat this process.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Write Command Latency *range*	ARRAY LUN	The number of write commands that were received and completed within the time range specified by the metric. The supported time ranges are: 0-2.55 ms 2.56-5.11 ms 5.12-10.23 ms 10.24-20.47ms 20.48-40.95 ms 40.96-81.91 ms 81.92-163.83 ms 163.84-327.67 ms 327.68-655.35 ms >655.35ms The following additional time ranges are supported only on VA 7410: 655.36ms-1.30S 1.31-2.61S 2.62-5.23S 5.24-10.47S 10.48-20.95S 20.96-41.91S 41.92-83.83S 83.84-167.67S >167.68S **Usage** This set of metrics provides a summary of the response time performance being achieved for write commands. The measured latency for a command includes all delays that occur during the processing of the command both inside and outside the array. If significant host channel delays are being encountered, they cannot be separated from the internal array processing time of a command by this set of metrics. In this case this set of metrics may not accurately reflect the performance capability of the array. The latency is measured from the time the command is received by the array through the completion of the data transfer for the command. The time required for command status transfer is not included.

Table 8 Performance Metrics (Continued)

Metric	Categories	Description/Usage
Write ECC Usage	DISK-PORTS	Specifies the counter that counts the total number of retries of the number of times the retry algorithm is invoked. If after five attempts an error of type "Corrected Write Error With Retry" is recovered, then five is added to this counter. If three retries are required to get a stable ECC syndrome before an error of type "Corrected Write Errors With Delay" is corrected, then those three retries are also counted here. The number of retries applied to unsuccessfully recover an error of type "Total Uncorrected Write Errors" are also counted by this counter. **Usage** Each of the write error counters provides a general indication of the quality of write operations. Any significant counts in any of the write error counters is an indication that drive operational quality may be having an effect on performance.
Write Rate (1.05 release) Write Throughput (prior to 1.05)	ARRAY LUN	The average number of host write commands completed per second. **Usage** This metric is a measure of the performance level being achieved for writes and also provides some indication of the demand level of the host workload. High write rates will not be achieved when the workload demand is low.
Write Throughput (1.05 release) MBytes Written Throughput (prior to 1.05)	ARRAY LUN	The average number of megabytes transferred per second by write commands. **Usage** This metric is a measure of the performance level being achieved for writes and also provides some indication of the demand level of the host workload. High write throughput will not be achieved when the workload demand is low. This metric is computed from the Logical Blocks Written Rate by converting logical blocks to megabytes. The conversion factor is 2048 blocks per megabyte.

armrbld

Description

The `armrbld` command manages the array rebuild process. It allows a user to initiate, cancel, monitor the progress of, or modify the characteristics of, a rebuild.

Note The virtual array rebuilds data online. Performing a rebuild should not impact array availability or overall array performance.

Syntax

armrbld {-r | -c | -p | -a {on | off} | -P {high | low}} <*array-id*>

armrbld -?

Options

-a {on|off}	Enable (on) or disable (off) Auto Rebuild. When enabled, the array automatically begins a rebuild in the event of a disk failure. When disabled, a rebuild must be started manually.
-c	Cancel a rebuild currently in progress. A rebuild started by Auto Rebuild cannot be canceled.
-p	Display information about the rebuild currently in progress on the array. The information includes the array's vendor and product ID and the current setting for Auto Rebuild and Rebuild Priority. The information also indicates one of the following: rebuild completion rate, no rebuild in progress, or rebuild failed.
-P {high|low}	Set Rebuild Priority. High sets the rebuild to the same priority as host I/Os. This allows the rebuild to complete as quickly as possible, but slows down the servicing of I/Os. Low sets the rebuild priority lower than host I/Os. This ensures that host I/Os are serviced first, but it delays the completion of the rebuild.
-r	Start a rebuild on the array.
-?	Display extended help message. Overrides all other switches.

Examples

Display the current state of a rebuild on host with alias blue. In this example the host is not currently performing a rebuild.

```
hpbs9011:# armrbld -p blue
Rebuild status:
    Vendor ID           = HP
    Product ID          = A6188A
    Rebuild progress    = No rebuild in progress

    Auto Rebuild is     = ENABLED
    Rebuild priority is = LOW

    The array is not currently rebuilding.
```

armrecover

Description

The `armrecover` reconstructs data mapping and array configuration in the event of the loss of NVRAM contents. The data maps are reconstructed using the latest copy of mapping information stored on the disk drives. Part of the recovery operation includes performing a parity scan on the contents of the entire array to validate the accuracy of the maps and to correct any drive parity inconsistencies. This process can take up to several hours depending on the amount of data on the array.

Caution Reducing the amount of cache memory on the array controllers will cause a loss of the maps. Do not attempt to use the `armrecover` command to restore the maps in this situation. The maps must be rebuilt after the array is formatted.

Syntax

armrecover {-s | -p | -v <*volume-set-id*>} [-c] [-override] [-f] <*array-id*>

armrecover <*array-id*>

armrecover -?

Options

None	Begin the recovery in interactive mode. The utility will display all recoverable volume sets, then prompt the user for the number of the volume sets to recover.
-c	This will cause continuous polling during the recovery. The recovery is monitored and the current progress is displayed at regular intervals.
-f	Available only on firmware version HP15 and greater (VA7100/7400) and A000 or greater (VA7410/7110), this option will perform a parity scan at the end of the rebuild. Not specifying this option disables parity scan.

-p	Begin the recovery in non-interactive mode. If there are multiple volume sets on the array, a list of the volume set numbers will be displayed. If there is only one volume set on the array, the recovery will be done on it. This option provides a mechanism to pass volume set information to a script designed to perform a recovery.
-s	Returns the recover ability status of the array, as well as the status of a recovery in progress. The status indicates if recovery is needed, and what percentage of the entire recovery has been completed. When used with the –c option, status will be returned at regular intervals allowing continuous monitoring of the recovery progress.
-v <*volume-set-id*>	Starts a recovery on the volume set indicated by volume-set-id. The volume set serial number is 16 ASCII characters in size. This option is intended for use only in environments where there are multiple volume sets on the array. The virtual array currently supports only a single volume set.
-override	When specified with other options, this will bypass checks on warning states and allow a recovery command to be issued. This option should be used with caution.
-?	Display expanded usage message. This option overrides all other switches.

Examples

Perform a recovery on the default volume set on array alias AutoRAID3.

```
armrecover -p AutoRAID3
```

Retrieve status for the recovery in progress on array serial number 00786b5c0000. Also have the status continually updated until completion.

```
armrecover -s -c 00786b5c0000
```

More About Using armrecover

The `armrecover` command is used to rebuild the maps from the metadata disks in the event of a map Loss. This is the only time this command should be used.

There are two situations to consider when using the `armrecover` command:

- If any errors logged during the recover attempt (such as a reset) the recover process will fail.

- If an error occurs while the recover process is run on an array that does not have a genuine map loss condition, the array will be left in a Recovery Failed warning state. If there are no other errors generated, the array will function in this state. To clear the Recovery Failed warning state, run a complete (successful) recover again.

armsecure

Description

The `armsecure` command manages the Secure Manager features of the array. For information on using Secure Manager, refer to the *hp surestore secure manager virtual array installation and user guide* included with the Secure Manager Software Media Kit (T1003). This document describes in detail the format of the Secure Manager table.

Syntax

armsecure –r –f <*filename*> -p <*password*> <*array-id*>

armsecure –w [-c] –f <*filename*> -p <*password*> <*array-id*>

armsecure {–c | –e | –d } -p <*password*> <*array-id*>

armsecure –n <*newPassword*> -p <*oldpassword*> <*array-id*>

armsecure -t [-c] [-h <*hostList*>] [-w <*WWNList*>] -f <*filename*> -p <*password*> <*array*-id>

armsecure -cp -ls <*LUN*> -ld <*LUNList*> -p <*password*> <*array-id*>

armsecure -cp -ws <*WWN*> -wd <*WWNList*> -p <*password*> <*array-id*>

armsecure -?

Options

-c

Clears the Secure Manager table on the array. This option is typically used with the write (-w) option to clear the table before writing. If the -c option is used alone, Secure Manager is disabled when the table is cleared. This avoids disabling the Command View SDM management host's ability to manage the array when all Configure access is removed. You will have to explicitly enable Secure Manager after using the -c option alone.

When used with the -t option, existing NODEWWN entries in the table on the array will not be copied to the table being created. This implies that the -c option will be used when writing the new table to the array. Not including the -c option in this situation will cause the entries in the newly created table to overwrite any duplicate entries in the existing table on the array.

-cp	Copies permissions from one LUN to other LUNs, or from one WWN to other WWNs. The current Secure Manager table is read from the array, new table entries are made to copy the specified permissions, and the table is written back to the array.
-d	Disables Secure Manager on the array. The Secure Manager table is not altered. When Secure Manager is disabled, all LUNs are accessible to all hosts.
-e	Enables Secure Manager on the array.
-f <*filename*>	Specifies the file on the host used to manage the Secure Manager table. The contents of the table are read from the array into this file. When updating the table on the array, the contents of this file are written to the array. Relative or absolute file paths are allowed. If a path is not specified, the current working directory will be used. When used with the -t option, the security table being created will be stored in this file.
-h <*hostList*>	Identifies the host(s) to be added to the Secure Manager table being created using the -t option. Each host will return its associated WWN(s), and these will be added to the table. A host must be running Command View SDM to be used successfully with this option. If a specified host is not running Command View SDM, it will be skipped without alerting the user. Hosts are identified by <*hostList*>, a comma-separated list of DNS names or IP addresses.
-ld <*LUNList*>	Identifies the destination LUN or LUNs to which permissions will be copied. Entries matching those of the source LUN will be created for each LUN specified. This option is only used with the -cp and -ls options. *LUNList* can be either a single LUN or a comma separated list of LUNs. The list may also include a range of LUNS. For example, 2-6 would indicate LUNs 2,3,4,5, and 6. When using the range format, all LUNs within the specified range must exist or the command will fail.
-ls <*LUN*>	Identifies the source LUN from which permissions will be copied. *LUN* must be a valid LUN currently existing on the array. This option is only used with the -cp and -ld options.
-n <*newPassword*>	Sets the password in the array to <*newPassword*>.

-p <*password*>	Specifies the password required to execute the command. The password must match the one set on the array, or the command will fail. This is required for all forms of the command. The password can be from one to eight characters long. Any printing character is legal, but it is best to avoid blanks and other special characters. The password "AUTORAID" is the initial password set at the factory. This is also the password set from the Virtual Front Panel if the real password is lost.
-r	This specifies that the Secure Manager table should be read from the array and written to the file specified by the –f parameter.
-t	Construct a Secure Manager table, automatically adding entries for the specified hosts. This option only creates the table, it does not write the table to the array. After the table is constructed, it can be edited to achieve the desired security, and then written to the array using the -w option. The table is stored in file <*filename*>. The -h <*hostList*> and -w <*WWNList*> options are used to identify the hosts that will be added to the table. For each host added to the table, entries will be made for each LUN on the specified array. For example, if there are 5 LUNs on the array, five entries will be made for each host — one for each LUN. The entries grant the host Write (W) access to each LUN. If neither -h <*hostList*> nor -w <*WWNList*> are specified, the entire subnet will be searched for hosts running Command View SDM. These hosts will then be added to the table. All DEFAULT entries are read from the current LUN security table and added to the table being built. If the -c option is not included, the existing NODEWWN entries will also be added to the table. If -c is included, the NODEWWN entries will not be copied to the table.
-w	This specifies that the Secure Manager table should be read from the file specified by the –f <*filename*> parameter and written to the array.
-w <*WWNList*>	Identifies the WWN(s) to be added to the Secure Manager table being created using the -t option.Each WWN is checked for valid structure, but no attempt is made to locate the device with the WWN. This allows the addition of table entries for hardware that is not yet operational. WWNs are identified by <*WWNList*>, a comma-separated list.

-wd <*WWNList*>	Identifies the destination WWN or WWNs to which permissions will be copied. Entries matching those of the source WWN will be created for each destination WWN. This option is only used with the -cp and -ws options. *WWNList* can be a single WWN or a comma separated list of WWNs.
-ws <*WWN*>	Identifies the source WWN from which permissions will be copied. *WWN* must already exist in the security table on the array. This option is only used with the -cp and -wd options.
-?	Display help message. Overrides all other switches.

Examples

Read the current contents of the security table into file secure.txt on host with alias green. The password is the default value, AUTORAID.

```
armsecure -r -f secure.txt -p AUTORAID green
```

Change the password on array alias green from the default of AUTORAID to s33k3r.

```
armsecure -n s33k3r -p AUTORAID green
```

Write the security table stored in file secure.txt to array alias green. The password is s33k3r. Clear the exisitng table before writing the new one, and re-enable Secure Manager.

```
armsecure -w -c -f secure.txt -p s33k3r green
armsecure -e -p s33k3r green
```

Copy the permissions from LUN 3 to LUNs 8, 10, 11, and 12. The array alias is blue, and the password is d0m1n0.

```
armsecure -cp -ls 3 -ld 8,10-12 -p d0m1n0 blue
```

armshell

Description

The `armshell` command provides an environment for executing multiple CLUI commands without the overhead imposed in the standard environment. When executing a command in the standard environment, each command opens the Java Virtual Machine (JVM), executes, then closes the JVM. When executing multiple commands, this continued opening and closing of the JVM increases the time required for command execution.

To avoid this situation, `armshell` opens the JVM once and keeps it open until you close it. This improves performance when executing multiple commands. A file containing CLUI commands can also be passed to armshell, automating frequently-used task sequences .

The exit command is used to close `armshell`.

Syntax

armshell [-e [on|off]] [< *command_filename*]

armshell -?

Option

-e [on|off]	Turns command line echo on or off. If not specified, echo is turned on.
< *command_filename*	Passes the CLUI commands stored in the specified file to armshell for execution.
-?	Display extended help message. Overrides all other switches.

armshell Commands

In addition to the standard CLUI commands, the following commands can be executed from within armshell.

< *filename*	Use the specified file as standard input. If more than one argument is given, only the first argument is used. All other arguments are ignored, except for the > command.

> *filename*	Use the specified file as standard output. If the file does not exist, it is created. If the file exists, it is overwritten. If more than one argument is given, only the first argument is used. All other arguments are ignored.
cd [*directory*]	Change the current working directory. If no argument is given, nothing occurs. If a directory is specified in absolute terms then it becomes the new working directory. If a directory is specified in relative terms, then starting from the current directory the new working directory is made. If more than one argument is given only the first argument is used, all other arguments are ignored except for the > command.
exitCode	Display the error code of the last command run.
exit	Exit the armshell environment.
echo [on|off]	Controls the state of command echo. If no argument is included, the state is toggled. Performs the same function as the command -e option.
ls [*filename*...][*directory*...]	List files in the current working directory (similar to the UNIX ls command). For each directory argument, list the contents of the directory. For each file argument, repeat its name and any other information requested. The output is sorted in ascending collation order by default. When no argument is given, the current directory is listed. When several arguments are given, the arguments are first sorted, but file arguments appear before directories and their contents. Directories are distinguished by a trailing slash.
print *filename*	Read a command file and write it on the standard output. If more than one argument is given, only the first argument is used. All other arguments are ignored, except for the > command. The number of lines written to the standard output before pausing defaults to 25. This can be changed through the setLines command. If the number of lines in the file exceeds what can be written in a single page, then paging will occur. Paging only occurs in the forward direction.
pwd	Print the path name of the current working directory.
record [*filename*]	Direct the command output to the specified file rather than the screen. If [*filename*] is not specified, the output is displayed on the screen.
help [*commandname*]	Displays usage information for the specified command. The output is the same as that displayed when using the ? option with the command. If no command is specified, the output lists the commands available from within the armshell environment.

Examples

This example launches `armshell` and turns on command echo:

```
armshell -e on
```

This example launches `armshell` and executes the commands stored in file test.bat:

```
armshell <test.bat
```

armtopology

Description

The `armtopology` command provides topology information about hosts and attached virtual arrays connected to the hosts for each LUN in the array. The command displays associated path information for each LUN which includes: host name (DNS or IP), host Node WWN, Port WWN, array product number, array serial number, array controller (1 or 2), redundancy group (1 or 2), LUN number, and device path (from host to LUN). This command provides this information only for hosts which have Command View SDM installed; if one of the specified hosts does not have Command View SDM installed, information will not be provided for that host.

Note Operation of this command requires CONFIG permission.

Syntax

armtopology [<*HostName-1*> <*HostName-2*> ...<H*ostName*-n>]

armtopology -?

Option

<*HostName-1*> <*HostName-2*> ... <H*ostName*-n>	To specify specific hosts, use the <HostName> option. Use either the DNS name or IP address of the hosts. Separate multiple HostNames with a space. If no HostName options are specified, all hosts discovered on the subnet with arrays will be displayed, provided they have Command View SDM installed.
-?	Display extended help message. Overrides all other switches.

Examples

This example displays information for three hosts: hostname1 and hostname2 connected to one array with two LUNs (0 and 1) and a third host connected to a second array, also with two LUNs (0 and 1). The command could be entered as:

```
armtopology  hostname1  hostname2  hostname3
```

The following example output would be produced for this command:

```
Host  Host Node WWN    Host Port WWN   Product SerialNumber C RG LUN  Device path
-------------------------------------------------------------------------------
host1 50060b000005aed6 50060b000005aed7 A6188A 00USP1001064 1 1  1  \\.\PHYSICALDRIVE1
host2 50060b000005cde7 50060b000005cde8 A6188A 00USP1001064 2 2  0  /dev/rdsk/c0t0d0
host3 50060b000005fgh8 50060b000005fgh9 A6189A 00USP1001234 1 1  0  /dev/rdsk/c1t0d0
host3 50060b000005ijk6 50060b000005ijk7 A6189A 00USP1001234 2 2  1  /dev/rdsk/c2t0d1
```

Note If array LUN security is enabled, only LUNs visible to the host will be displayed for that host.

Controlling armtopology Output

The output displayed by the `armtopology` command can be configured using entries in the `PanConfigParams.txt` file. Both the desired parameters and the output format can be specified. The available parameters and their default values are listed in Table 9.

The following entry is added to the `PanConfigParams.txt` file by default:

```
ARMTOPOLOGY_FORMAT = HOST,ONWWN,OPWWN,DB_PROD,DB_SN,
CONTROLLER,RG,LUNID,DB_DEVHOST, DB_DEVPATH
```

The parameters specified are displayed. This entry can be modified to change the parameters output.

To control the output format of the data displayed, entries can be made to the `PanConfigParams.txt` file in the following format:

`at_`*`key`*`=`*`description`*`,`*`columnwidth`*

`at_`*`key`* identifies the specific parameter

`description` is the text displayed at the top of the output column

`columnwidth` specifies the width of the output column. When *`columnwidth`* is set to -1, the column expands to the width of the longest value. When the Host parameter is set to -2, its column expands to the width of the longest hostname. Otherwise, it expands only to the specified width.

For example, the following entry changes both the description and the column width of the at_DB_REV parameter:

```
at_DB_REV=Revision,8
```

Table 9 armtopology Output Parameters

Key value	Description	Column width
at_HOST	Host	-2[1]
at_ONWWN	Host Node WWN	16
at_OPWWN	Host Port WWN	16
at_RNWWN	Device Node WWN	16
at_RPWWN	Device Port WWN	16
at_LUNID	LUN	4
at_LUNWWN	LUN WWN	32
at_RG	RG	2
at_CONTROLLER	C	2
at_DB_ID	Device Unique ID	36
at_DB_VEND	Vendor	8
at_DB_PROD	Product ID	16
at_DB_SN	Serial Number	13
at_DB_REV	Rev	4
at_DB_NWWN	Device Node WWN	16
at_DB_PWWN	Device Port WWN	16
at_DB_ALIAS	Device Alias	10
at_DB_HWPATH	HW Path	8
at_DB_DEVPATH	Device Path	-1
at_DB_TYPE	Device Type	20
at_DB_TYPEID	DT	2
at_DB_INTYPE	Device Interconnect	20
at_DB_INTYPEID	Device Interconnect ID	2
at_DB_LUN	LUN	4
at_DB_COMM	Accessible	16
at_DB_DEVHOST	Device Host	20
at_DB_ONODEWWN	ORG. Node WWN	16
at_DB_OPORTWWN	ORG. Port WWN	16

[1]The Host column will expand to the width of the longest hostname if this is set to -2, otherwise it will be truncated to the specified length.)

secadmin

Description

The secadmin command provides an environment to manage the security database. The <host> can be a DNS name or the IP address of a host. The secadmin command will prompt for a username and password.

After installing the command view SDM software, there are no users in the security database and the default username will be "Administrator" and the default password will be "administrator" (note - case sensitive).

Note Important! As you add users, make sure that one of the users is in the Administrator group to allow that user to administer the security database. Until you make one of the users a member of the Administrator Group, you will not be allowed to exit from the secadmin command.

Regardless of what group a user is in, all users are allowed access to all other CLUI commands (only users in the Administrator group are allowed to administer the security database and use the secadmin command).

Note When you are using security over a network, the security module will attempt to resolve the hostname/IP address to a fully qualified name. If the network resolves the hostname/IP address to a fully qualified name, then this must be used as the hostname (i.e. myhost.boi.hp.com). If the network does not resolve the hostname to a fully qualified name, then only the hostname (without the domain) must be entered into the security database.

Note Username, hostname, and group can not include the pipe character (|) and none of the fields, username, hostname, group, or passwords can include control characters (non-printable).

Syntax

secadmin -host <host>

secadmin -?

<host> can be a DNS name or the IP address of a host.

Options

The secadmin command supports the following options:

-host — The only option available from the secadmin command is -host.
<host> Selects the host that has the target security database to modify.

-? — Display expanded usage message. Overrides all other options.

The following options are available from within secadmin:

add -user <user> -group <group> -host <host>
Adds a user to the security database. The user, group, and host are required and you will be prompted for a password.

del -user <user> [-group <group>]
Deletes a user from the security database. If a group is specified, then only that entry will be deleted. If no group is specified, then the user is deleted form all groups.

list
List the users in the security database.

host <host>
connects to a new host in order to modify its security database. This requires new authentication.

exit
exits the secadmin environment.

help
Display extended help message.

External Influences

Environment Variables

LC_MESSAGES determines the language in which messages are displayed.

The current language settings can be checked with locale(1).

Return Value

The secadmin command returns the following values:

0 - Successful completion.

1 - An error in execution (I/O, array, security, etc.) occurred.

2 - An error in command syntax occurred; an unknown option was specified.

6 - A resource is missing; either a file containing localized strings for output or a certain localized string in that file is missing.

Examples

Enter the secadmin shell on the host with the hostname of Host1.

secadmin -host Host1

To add a user named MYUSER, that will be connect from host MYHOST, to the security database who will be able to administer the security data base then from within the secadmin shell type:

add -user MYUSER -group Administrator -host MYHOST

Command View SDM User Interface

5

The Command View SDM User Interface (CVUI) adds a simple, text menu-based interface as a front end to the Command View SDM commands.

Some of the benefits the CVUI offers include:

- **Full functionality** - the CVUI provides the same complete management capability and functionality as the Command Line User Interface (CLUI).
- **Ease of use** - the menu structure relieves you of the need to memorize command syntax. This is useful if you use the command infrequently.
- **Easy remote access** - the CVUI is particularly useful when using telnet to connect to a remote Command View SDM host.

Starting the Command View SDM CVUI

The Command View SDM User Interface is started from a command line. To start the interface, enter the appropriate command:

`cvui` **<< On a local host**

`cvui -h <hostname>` **<< From a remote client**

`cvui -h <hostname> {array_id}` **<< From a remote client - connects to specified array**

CVUI Example

The following example illustrates the process of starting the CVUI and selecting an array to manage. The process involves inputting the value for the desired selection. In this example, a connection is made to remote host hpbs9011 and the array "blue" is selected for management.

```
hpbs4251:# cvui -h hpbs9011   << Run CVUI on remote host hpbs9011

                              CVUI version 1.01.0011

Storage Device Selection
Host:  hpbs9011

Choice  Device Id         Alias   Device Type
=====================================================
     1  50060b00000921d0  blue    HP Storage Array
     2  50060b000009736f  green   HP Storage Array
     3  50060b00000921a3  yellow  HP Storage Array
     4  Refresh

(1-4=Choice, a=App menu, h=Help, x=eXit)>1   << Array " blue" selected

Storage->HpArrayMain
DeviceID:    hpbs9011:50060b00000921d0
DevicePath:  /dev/rscsi/c30t7d0          Alias:     blue
DeviceType:  HP Storage Array            DeviceSn:  00SG04990114
Product:     HPA6188A00SG04990114

Choice  Description
================================================
     1  Create/Delete LUNs
     2  View properties
```

```
      3  Diagnostics
      4  Configure operating parameters
      5  Configure fibre channel
      6  Security
      7  Licensed features
      8  Firmware
(1-8=Choice, a=App menu, b=Back, h=Help, x=eXit)> << Enter value for the desired task
```

Several levels of menus are required to execute a command. Continue entering the number of the operation until the action is performed.

CVUI Configuration

For CVUI configurable options, refer to the comments in the following files:

Windows NT 4.0 and Windows 2000:

```
<drive>:\Program Files\Hewlett-Packard\sanmgr\command-
view\client\sbin\cvui.cmd
```

HP-UX and Linux:

```
/opt/sanmgr/commandview/client/sbin/cvui
```

CVUI Screen Exporting ROWS and COLUMNS

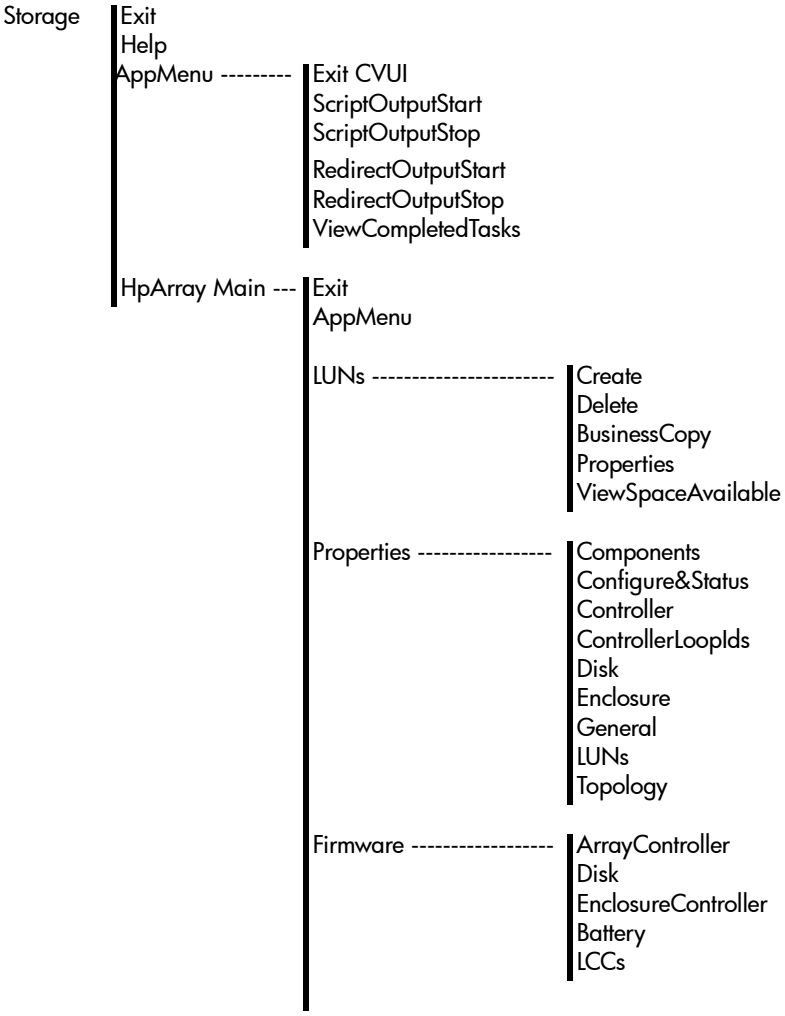
The CVUI uses the environment variables ROWS and COLUMNS. Both HP-UX and Linux do not always mark these variables to be exported to new environments so it is left to the user to make the appropriate changes to export both ROWS and COLUMNS. There are many ways to accomplish this but the simplest is to add the following line to the users startup file.

```
export ROWS;export COLUMNS
```

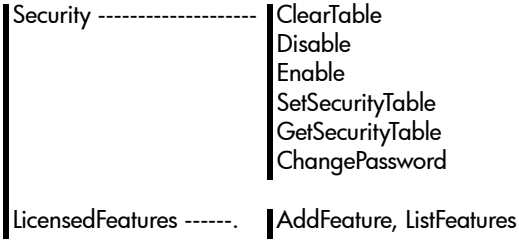
It is possible to modify the CVUI startup script itself to force a certain number of rows and columns but this is not the preferred method. If the ROWS and COLUMNS variables are not available to the CVUI when starting, the default values of 24 rows and 80 columns will be used, a message indicating that these values have been selected will be displayed to the user.

CVUI Menu Map

The following map shows the main structure of the CVUI menus (some additional levels are not shown). For additional help on the operation of the CVUI interface, select "h" from any CVUI screen.



- HP Array Main
  - Diagnostic
    - ArrayLogs
    - ArchivedLogs
    - ResetArray
    - ShtudownArray
    - RestartArray
    - Rebuild
    - ResetFRU
    - DownFRU
    - IncludeFRU
    - FormatDisks
    - Scrubbing
    - RecoverNVRAM
    - BreakAdvisoryLock
  - Configure
    - Alias
    - AutoFormatDrive
    - CapacityDepletionThreshold
    - ReadCacheDisable
    - RebuildPriority
    - WriteCacheEnable
    - DisableNVRAMonUPSAbsent
    - SimplifiedResiliencySetting
    - AutoInclude
    - AutoRebuild
    - HotSpare
    - LUNCreation Limit
    - RAIDLevel
    - EnableOptimizePolicy
    - EnablePrefetch
    - DisableSecondaryPathPresentation
  - Configure Fibre
    - PortLoopID
    - PortBehavior
    - PortTopology
    - PortQueueFullThreshold
    - PortDataRate
    - DefaultFC
    - HostPortBehaviorTable


Security ----------
ClearTable
Disable
Enable
SetSecurityTable
GetSecurityTable
ChangePassword
LicensedFeatures ------.
AddFeature, ListFeatures

Array Logs

6

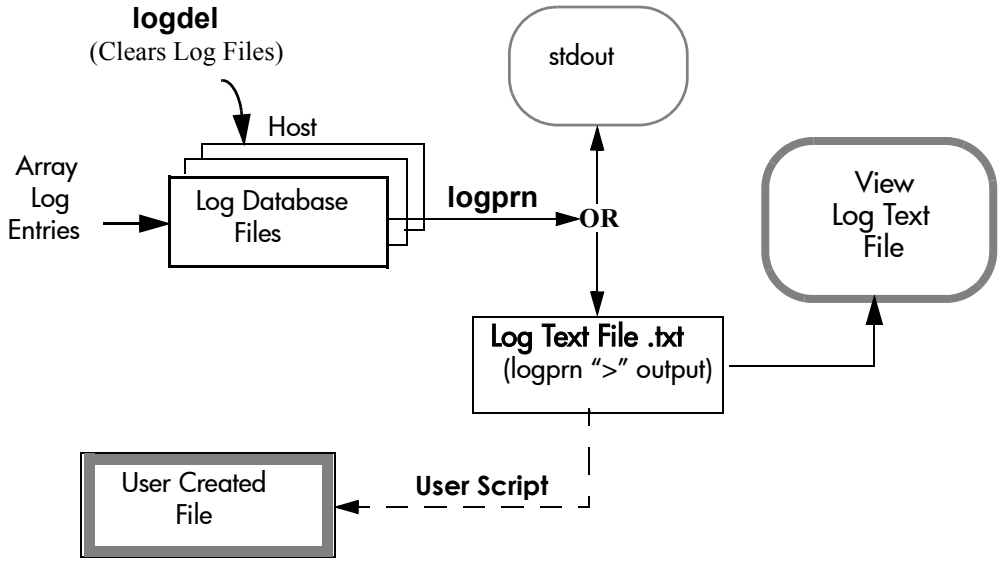
The array continually monitors and records information reflecting the current operating state of the array. This information is stored by the array in its internal memory. The Command View SDM software reads this information and stores it in log database files on the host. An overview of array log management is shown in Figure 5.

There are two types of log files:

- **Controller (Device) Logs** - All internal array actions or events are monitored by the controller and saved as event messages in the array's internal memory. The Command View SDM software periodically polls (every 15 minutes, the default) the array and stores these events as entries in the controller log database file.
- **Usage (State) Logs** - Command View SDM periodically (every 24 hours by default) runs the `armdsp -a` command to obtain the current state configuration of the array. It copies the output of this command into the usage log file.
- **Software logs** - contains entries indicating when the controller event log poller has run and how many entries were collected.

Log files are stored in a directory structure that identifies the file by date and file type. See "About Log Files" on page 231.

Figure 5 Array Log Management



Managing the Size of the Log Files

Over time, the log database files can become quite large. To avoid consuming excessive disk space, you can restrict the size of the files. There are two options for managing the size of the log files.

- Manually delete the files using the `logdel` command. For more information on the logdel command, refer to "logdel" on page 228.
- Configure the operating parameters to automatically limit the log file size. This is done by adding the following parameters to the `PanConfigParams.txt` file

  `LOG_MAXIMUM_DAYS=nn`

  This entry defines the maximum number of days to hold log files. If a log file is over the maximum, it will be removed,

  `LOG_TOTAL_MAXIMUM_MEGABYTES=nnn`

  This entry defines the total maximum number of bytes for any configured array. Once this value is reached, the oldest log entries will be deleted

Log Commands

Three utilities and their associated commands are available for managing the array logs.

- logprn - used to view historical logs
- logdel - used to delete historical logs
- armlog - used to read the current controller and disk logs

These commands and some detail on the format and structure of the log files is discussed in this section.

logprn

Description

The `logprn` command reads log entries from log database files and directs them to stdout (screen). The output can also be redirected to a text file, which is required for the Command View SDM log tool operation. The log entries retrieved can be limited by setting the start and stop range option. A filter option (-t) can be used to define the exact type of log entries to retrieve.

Syntax

logprn -a <array-id> [-s <*start_time*>] [-e <*stop_time*>] [-d <*dir*>] [-t <*log_type*>] [-sv <*severity*>] [-b | -v | -xml] [-lang <*lang_num*>]

logprn -?

Options

-a <*array-id*> -a <*hostname:><array-id*>	The array ID which can be the: serial number, alias, device path, or world wide name.
-d <*dir*>	Directory where the log files are located. If not specified, this directory is obtained from the system configuration file settings.
-s <*start_time*>	Specifies the oldest log entry to view. If not specified, viewing starts with the oldest log entry. The format for entering time is: mmddhhMM[yyyy] where: mm = month (01-12) dd = day (01-31) hh = hour (01-23) MM = minute (01-59) yyyy = year (such as 2001), if not specified current year is used.
-e <*stop_time*>	Specifies the newest log entry to view. If not specified, viewing ends with the newest entry. Uses same time format as *start_time*.

-sv <*severity*>	Filters the log entries based on severity. Only log entries with the specified severity or greater will be displayed. Severity values are 0, 1, 2, 3, 4, with 0 being the highest severity.
-t <*log_type*>	Specifies the type of log entries to view. Valid types are: TargetDeviceEvent HostEvent ControllerEvent ChangeEvent AbtermEvent Device = Controller log files, only Software State = Usage log files only All = Both Controller (Device) and Usage (State) log files.
-b	Output is brief format. If neither -b or -v are specified, unformatted output is used.
-v	Output is verbose format. If neither -b or -v are specified, unformatted output is used.
-xml	Creates output in XML format.
[-lang <*lang_num*>]	Identifies the format used for the date and time in the log output. The format corresponds to the language selected by *lang_num* value. The following language formats are available: 1 - English (This is the default format) 2 - French 3 - Italian 4 - German 5 - Spanish
-?	Displays the help message. Overrides all other switches.

Examples

Verbose output

Display the entries for the device logs (`dd-ctrlr.log`) for the array, myarray, between the times Nov 19, 8:30 am, 2000 and Jan 01, 3:30 pm, 2001with verbose output, by entering:

```
logprn -a myarray -s 111908302000 -e 010115302001 -t
Device -v
```

This command will produce the following output (only one entry shown):

```
DeviceUniqueName      = 50060B000008A085
Date                  = October 13, 2000
Time                  = 8:27:34 AM EDT
DeviceName            = HP VA7100
DeviceType            = VirtualArray
DeviceSequence        = 90339
FruIdentifier         =
FRULocation           = M/C1
LogCode               = 374
Count                 = 1
Sequence              = 2447
Type                  = Controller Event
Text :
The text description of the error provided here.
```

Standard Output

Display all log entries to standard out for the local host.

```
logprn
```

This command produces the following output (only one entry shown):

```
October 13, 2000 8:27:34 AM EDT HP VA7100
VirtualArray 50060B000008A085
The text description of the error will be provided here.
BUS: Local
```

Brief output

Display all log entries in brief output for array Array1 on remote host server6.

```
logprn -a server6:Array1 -b
```

This command will produce the following output (only one entry shown):

```
50060B000008A085_  October 13, 2000_8:27:34 AM EDT_HP
VA7100_VirtualArray_90339_M/C1_374_1_2447_1_The text
description of the error will be provided here...
```

Limit Log Type

Get only Abnormal Termination events for an array with an alias of DevArray connected to the local host. Find the logs in the directory /temp/logs.

```
logprn -a DevArray -t AbtermEvent -d /temp/logs
```

logdel

Description

The `logdel` command deletes log database files. Only files older than two months old can be deleted; two full-calendar months of files are always saved and cannot be deleted. This command also allows you to delete specific log file types or to delete all log file types. See "About Log Files" on page 231 for information about log file types).

Syntax

logdel -a <*array-id*> [-d <*dir*>] -e <*stop_time*> -t <*log_type*>

logdel -?

Options

-a <*array-id*> -a <*hostname*:*array-id*>	The array-id can be: array serial number, alias, device path, or world wide name of the array.
-d <*dir*>	Directory of the log files to be deleted. If not specified, this directory is obtained from the system configuration file settings: /opt/sanmgr/commandview/server/confg/PanConfigParams.txt
-e <*stop_time*>	Specifies the newest log file to delete. The format for entering time is: mmddhhMM[yyyy] where: mm = month (01-12) dd = day (01-31) hh = hour (01-23) MM = minute (01-59) yyyy = year (such as 2001), if not specified current year is used Although all time fields are required, only the month and year are used by the command.

-t <*log_type*>	Identifies the type(s) of log files to delete. Valid types are: Device (controller) State (usage) All
-?	Display help message. Overrides all other switches.

Examples

Delete all the logs on array serial number 00USP1001089. Delete all entries up to August 2001.

```
logdel -a 00USP1001089 -e 080100002001 -t All
```

armlog

The `armlog` command reads controller event log messages directly from the array. The `armlog` command is described on page 148.

About Log Files

There are two types of log database files, as mentioned earlier, generated by the array: controller logs and usage logs. Each type of entry is stored in its own log database file.

- **Controller (Device) Logs** - Controller log entries are generated from the internal array events. Command View SDM polls the array every 15 minutes to retrieve log entries. These log entries are stored in controller log database file.

  The poll interval is controlled by the Controller Log Polling Interval setting (default = 15 minutes) in the array software configuration file:

  `/opt/sanmgr/commandview/server/config/PanConfigParams.txt`

- **Usage (State) Logs** - Entries for the usage log database are generated from the output of the `armdsp -a` command. See "armdsp" on page 131 for more information. The Command View SDM log software runs the `armdsp -a` command and stores the output as entries in the usage log file. The interval at which this occurs is determined by the State Log Polling Interval setting in the array configuration file. The default setting is 24 hours but can be changed.

Directory Structure

The array software creates the log directories on a daily basis. The directory structure for the controller database and the usage database is shown below:

```
/<BaseLogDirectory>/device/<arrayWWN>/2000-01/01-ctrlr.log
                                             /01-usage.log
                                             /02-ctrlr.log
                                             /02-usage.log
                                                    .
                                                    .
                                          2000-02/01-ctrlr.log
                                                 /01-usage.log
```

All log files are located under a user specified directory `<BaseLogDirectory>` determined at installation. The Controller and Usage log files are located under the `device` directory. The `arrayWWN` directory is determined by the world wide name of the array. The next directory specifies the year and month (yyyy-MM) the file was created for

entries. The file name consists of the creation day (dd) followed by the file type name (ctrlr for controller or usage).

The directory for the software database logs is:

```
/commandview/server/logs/software/yyyy-dd/dd-sw.log
```

The entries are organized into directories identifying the year and month (yyyy-MM) the file was created. The file name consists of the creation day (dd) followed by the software (sw) file type name.

Log Entry Format

If you wish to create your own user file filtered on specific entries from the Log Text File, you can create a script to generate the desired output. An entry in the log text file consists of one line with multiple data fields containing the following information:

DeviceUniqueName, Date, Time, DeviceName, DeviceType,

DeviceSequence, FruIdentifier, FRULocation, LogCode, Count;

Sequence, Type, Text

Each field in the line entry is separated by a field separator with the end of the line terminated by a record separator:

[Field 1] [FS] [TAB] [Field 2] [FS] [Field 2] [FS] [TAB]...[field n] [FS] [Tab] [RS] [C_RL_F]

The field separator (FS) is a CTRL _ (0x001f) character and the record separator (RS) is a CTRL ^ (0x001e) character.

If a field [Field n] is missing, the FS and TAB for that field will still be present.

[Field 1] [FS] [TAB] [FS] [TAB] [Field 3] [FS] [TAB]...[field n] [FS] [Tab] [RS] [C_RL_F]

Using the information provided here, it is possible to create a script file to access the log text files and sort on any number of the log entries to produce a user sorted log file.

Performance Logs

In addition to the event logs, array performance data is logged. Performance data is stored in a log structure similar to the event logs. Performance data is logged continually while the array is in operation. A new performance log is created every 24 hours beginning at 12:00 a.m. The array directory structure is shown below:

```
../commandview/server/logs/performance/arrayuniquename/
YYYY-MM/dd-perf.log
```

An example of this directory structure for an array with a unique name of "W6000123", for February 28, 2000, would be:

```
../commandview/server/logs/performance/W600012/2000-02/
28-perf.log
```

For information on reading performance logs, refer to "armperf" on page 159.

Port Statistics Log

A separate log file is used to store the port statistics metrics. These metrics indicate low level port activity and errors. The port statistics logs use a directory structure similar to that of the performance log, but the file name is dd-portStatistics.log:

```
../commandview/server/logs/performance/arrayuniquename/
YYYY-MM/dd-portStatistics.log
```

Managing the Size of the Performance Log Files

You can configure the operating parameters to automatically limit the performance log file size. This is done by adding the following parameters to the `PanConfigParams.txt` file

`PERFORMANCE_DB_MAX_SIZE=nnn`

Sets the maximum amount of disk space in Mbytes that performance log files can consume. Once this limit is reached, the oldest performance log files are automatically deleted. A value of zero will not delete any logs.

`PERFORMANCE_KEEP_MIN_LOGS=nn`

Sets the minimum number of days worth of log files to keep. This parameter overrides the PERFORMANCE_DB_MAX_SIZE parameter if the two parameters conflict. The default is seven days. For the default case, a minimum of seven days worth of performance log files will be kept for each device regardless of the max disk space setting.

PERFORMANCE_LOG_CLEAN=nn

Defines how often (in hours) the performance logs will be checked to see if log files need to be deleted, based on the PERFORMANCE_DB_MAX_SIZE setting. The default setting is 24 hours.

Array Licenses

7

A single-host license to use (LTU) is provided with each array purchase. An LTU is defined as the right to use one copy of the software on one host at one time. Command View SDM requires the installation of a license key to confirm one LTU is present for the host system. Additional license keys may also be required for other products (see HP Modular Software Products in the Description Chapter).

Following are some important concepts pertaining to Command View SDM license keys:

- A Command View SDM license key is tied to a specific host/management station.
- A license key is required for each host/management station installation of the software. Client installations do not need a license key.
- A host/management station without a valid license key will not allow client access.
- The host software processes (events, logging, etc.) will continue to run regardless of whether a license key is present

The InstantOn License Key

Upon installation of the Command View SDM software, an InstantOn license key is automatically installed. This is a temporary license key that allows full access for a period of 60 days. If a permanent license key is not obtained during this period, the InstantOn license will expire, and the software will no longer allow user access. Warning messages will be displayed as the expiration date approaches, reminding you to obtain a permanent license key.

Obtaining Permanent License Keys

There are several ways to obtain a permanent license key, to accommodate different installation environments:

- Via the Graphical User Interface

This requires a graphical display, Internet access, and it must be run locally on host/management station. If these requirements are met, this is the simplest way to obtain and install a license key.

- Via the Web

This requires a web browser and Internet access, and can be run from any location. If these requirements are met, this is the next best option.

- Via email/phone/fax

If neither of the above options is possible, this method can be used.

Obtaining License Keys via the Graphical User Interface (licApp)

The graphical user interface can be started using the licApp autoInstall command. A series of screens will be displayed prompting you for the appropriate information. After the information has been entered, it will be sent to HP and validated. Once validated a license key will be sent back, and installed on the system.

for example:

licApp autoInstall HP_CommandView_SDM

Obtaining License Keys via the Web

License keys can also be obtained using the Webware password delivery service web site.

https://webware.hp.com/welcome.asp

Click on the Generate Product Password(s) link to obtain the license key.

Once the necessary information has been entered and validated, a license key will be sent to you.

Obtaining License Keys via Email, Phone, or Fax

If necessary, license keys can be obtained by contacting the HP Password Center.
Hewlett-Packard Password Center for U.S.A:
Phone: (801) 431-1597 or (800) 326-0411
Fax: (801) 431-3654
Hours of operation: 6:00 am to 6:00 pm MST
Americas_password@cnd.hp.com

Hewlett-Packard Password Center for Europe/Africa:
Phone: (+31-55-543-4642)
Fax: (+31-55-543-4645)
Hours of operation: 9:00 to 18:00 CET
Europe_password@cnd.hp.com

Hewlett-Packard Password Center for Asia Pacific:
Phone: (outside Japan) (+81-3-3227-5672)
Phone: (within Japan) 03-3227-5264
Fax: (+81-3-3227-5238)
Hours of operation: 9:00 am to 5:00 pm JST
Asia_password@cnd.hp.com

Installing License Keys

If the graphical user interface (licApp) was used, the license keys will have been installed automatically and no further action will be necessary. If not, the license keys will need to be saved in a plain text file, and manually installed (multiple keys can be included in a single file). There are two options for installing license keys from a file:

1. Use the licUtil command to install the keys from the specified file. This can be used to install the keys on a local or remote system. If the host is not specified the keys will be installed on the local system.

   licUtil install <file_name> [<host>:]<product_name>

   ex. licUtil install keys.txt HP_CommandView_SDM

   ex. licUtil install keys.txt jupiter:HP_CommandView_SDM

2 Use the licApp command to launch the graphical interface to install the license keys. A dialog box will be presented to locate the license key file and select the keys to be installed.

for example:

licApp import HP_CommandView_SDM

License Command Locations

The licApp and licUtil commands can be found in the following locations:

For HP-UX and Red Hat Linux:

/opt/sanmgr/cssi/Licensing/sbin

For Windows:

C:\Program Files\Hewlett-Packard\sanmgr\cssi\Licensing\sbin

Array License Commands

licApp

Description

The licApp command launches the AutoPass GUI. The licApp command can be used to obtain license keys during installation or at a later time.

Syntax

licApp { -a | -i | -e | } <product_name>

licApp -l

licApp -?

Options

licApp supports the following options:

-a	Launches application window to automatically download and install license keys for the product.
-i	Launches the application window to install license keys from a file.
-e	Launches the application window to export an installed license key to a file.
-d	Launches the application window to display information about the installed license keys.
-l	Displays a list of the products supported by this application. Note that these names are case sensitive.
-<product_name>	The name of the product to perform the license query. Note that these names are case sensitive.
-?	Displays this help message.

Examples

Automatically launch application and install the HP CommandView SDM license

licApp -a HP_CommandView_SDM

licUtil

Description

The licUtil command allows you to install and remove software licenses. The licUtil provides an interface to install, remove, and display information about software licenses. The hostname can be a DNS name or the IP address of a host. If it is not specified, licUtil uses the name of the local host. All remote management clients must be added to the access.dat file on the host to gain access to the array.

Syntax

```
licUtil -l [<host>]
licUtil -i <file_name> [<host>:]<product_name>
licUtil { -d | -r } [<host>:]<product_name>
licUtil -?
```

Options

licUtil supports the following options:

-l	Displays a list of the installed products supported by this command.
-d	Displays license information for the specified product.
-i	Installs license keys from a file.
-r	Removes all the license keys for a product.
<host>	Specifies the host for which the command will be evaluated. If unspecified the local host is used.
<product_name>	Specifies the product for which the command will be evaluated.
<file_name>	Specifies the location of a text file containing license keys.
-?	Display expanded usage message. Overrides all other options.

Examples

Display license information for product with the alias HP_CommandView_SDM.

```
licUtil -d HP_CommandView_SDM
```

Solving Problems

8

This chapter identifies problems you may encounter when installing and using Command View SDM. It takes you through the steps typically required to solve each problem. If the problem you are experiencing is not include here, the following resources may provide a solution.

- HP support contact
- HP support web site
- HP storage forums

PROBLEM

Command View SDM stops working when Secure Manager is enabled.

Command View SDM cannot manage the array.

SOLUTION

If Command View SDM cannot communicate with array, it indicates that the host on which Command View SDM is running does not have "Configure" (C) permissions on any LUN it can access on the array. Typically the LUN 0 entry in the LUN security table is used to grant Configure permission to all hosts. If access to LUN 0 is restricted, the host may no longer be able to use Command View SDM to manage the array.

Correcting this problem requires editing the array LUN security table. If there is another Command View SDM host which can communicate with the array, you can use that host to edit the LUN security table. From the functioning host, perform the steps below.

If there is not another Command View SDM host, you will have to disable LUN security using the virtual front panel. For more information on using the virtual front panel, see the *HP StorageWorks Virtual Array Installation Guide*. When security has been disabled, continue with the steps below.

1 Read the LUN security table from the array into a file:

```
armsecure -r -f <filename> -p <password>} <array-id>
```

2. Identify which LUNs the non-functioning host can access. You will need to know the World Wide Node name of the host to identify its entries in the table.
3. On one of the entries which grants the host access to a LUN, modify the permissions to include configure (C). The entry will be look like this, which grants access to LUN 1:

   ```
   NODEWWN 4001a5500b060012 1 WC
   ```
   ◄—— Add "C" to permission
4. Write the updated LUN security table back to the array:

   ```
   armsecure –w -c –f <filename> -p <password>} <array-id>
   ```
5. Enable Secure Manager:

   ```
   armsecure –e -p <password>} <array-id>
   ```
6. Discover the management path to the array:

   ```
   armdiscover
   ```

PROBLEM

Command View SDM stops working after updating the array host port behavior table.

SOLUTION

If the host port behavior is set incorrectly for the CommandView management station, the management station may lose the ability to manage the array. For example, if the host port behavior for a Windows 2000 management station is inadvertently set to HP-UX, CommandView may no longer be able to manage the array.

If this situation occurs, there are two ways to correct the problem:

- If another CommandView Management station is available, use it to correct the array host port behavior table entry for the malfunctioning management station.
- Use the Serial CommandView tool to clear the host port behavior table on the array. The Serial CommandView tool is available to HP trained support personnel only.

PROBLEM

I get a 401 error when trying to manage the array from a browser.

SOLUTION

This indicates that the correct access permissions have not been set on the Command View SDM host. Access permissions are managed using a configuration file on the Command View SDM host. To allow a remote client to manage the array, the IP address of the remote client must be added to the file.

The following files are used to control client access:

- `access.dat` - HP-UX, Linux, and Windows (standard installation)
- `authorizedClients.dat` - HP OpenView Storage Area Manager (SAM) installation

To set up remote client access:

1. On the Command View SDM host, open the configuration file in an ascii text editor. The file is located in the following directory:

   `/opt/sanmgr/hostagent/config/` **<< HP-UX and Linux**
   `\sanmgr\hostagent\config\` **<< Windows**
   `\sanmgr\managementserver\config\` **<< Windows - HP OpenView SAM**

2. Add the IP address for each client requiring access to the arrays connected to the host. Or remove the IP address for any clients you no longer want to have access.

   Single client IP addresses can be added, or a range of IP addresses can be added using the wild card "*". For example; 10.62.128.* grants access to any client on subnet 128. The use of wildcards is recommended when connecting from clients configured for dynamic host configuration protocol (DHCP).

3. Save the configuration file.

4. Verify that the client browser now has access by entering the following URL:

   `http://<hostname-or-ipaddress>:4096`

   The following message should be returned by the host:

   ```
   (c) Copyright 2000-2002 - Hewlett-Packard Company

   hp StorageWorks Command View web server
   ```

PROBLEM

After installing Command View SDM, the arrays I expected to see in the Launcher do not appear.

When I run the armdsp -i command, the arrays I expected to see in the output do not appear.

SOLUTION

During the software installation process, the armdiscover command is launched to locate all arrays connected to the host. This information is then used to populate the Launcher screen. If there is a functional array connected to the host that does not appear in the Launcher screen, it may be necessary to repeat the discovery process.

To rediscover the arrays:

1. Check the disk array hardware and make sure it is operating properly, and that the array is connected to the host, switch, or hub.
2. Manually stop the HostAgent and OpenDIAL services. See "Starting/Stopping HostAgent and OpenDIAL" on page 67.
3. Delete all files in the `../sanmgr/hostagent/pdb` folder. This causes OpenDIAL to rebuild the database files with the array devices that are discovered.
4. Manually restart the HostAgent and OpenDIAL services.
5. Execute the `armdiscover` command to initiate the discovery process.
6. Check the Launcher to ensure the array is now displayed. You can also execute the `armdsp -i` command to display the arrays that were discovered.

If this does not solve the problem, contact support for assistance.

PROBLEM **Command View SDM is not working properly. I have exhausted all other possible solutions without success.**

SOLUTION Remove and reinstall the Command View SDM software. Before doing so make sure the host meets all necessary requirements.

PROBLEM **Security can not be entered because the password for the Administrator has been forgotten or there are no Administrators in the UserDBFile.**

SOLUTION Run the HA_Dial_Stop command. Using an editor remove all data in the /sanmgr/commandview/server/data/UserDBFile leaving a zero length file. Run the HA_Dial_Start command. Now you can use the default username/password, Administrator/administrator, to enter the security tool. Add users as normal, remembering to add a user to the Administrator group. You will have to re-enter all the users that were in the original UserDBFile.

Appendix

A

Using Command View SDM on a Serial Port

Should it be necessary, Command View SDM can be run over a serial port on a Windows host. This may be useful in situations when the normal Fibre Channel connection is not available. Because a serial connection is slower, management tasks will take longer to complete.

Note Command View SDM over a serial port is not supported on HP-UX or Linux.

Command View SDM operates the same over a serial port as over the fibre connection, however the following functionality is not available:

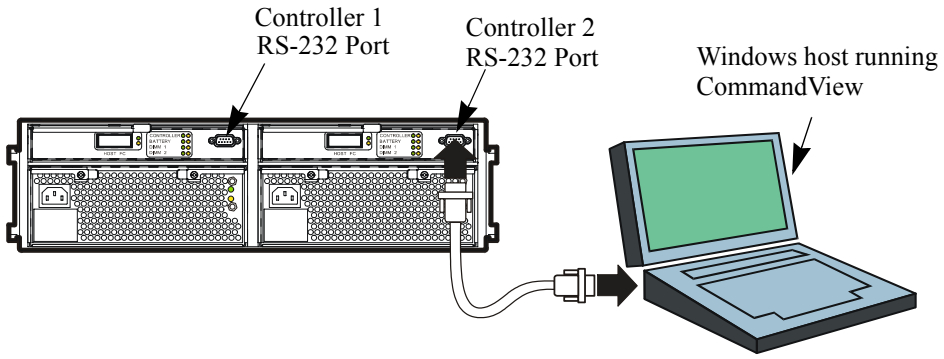
- Performance metrics are not available.
- Firmware download is disabled.
- The CVUI interface is not supported.

Connecting to the Array Using a Serial Port

To use Command View SDM over the serial port, you must connect a Windows host running Command View SDM to the RS-232 port on the array controller. To connect the host to the array, perform the following steps:

1. Connect one end of an RS-232 null modem cable to the RS-232 port on either one of the array controllers.

Figure 6 Making a Serial Connection to the Array



2. Connect the other end of the RS-232 cable to the RS-232 port on the Command View SDM host.

   Make sure the the host RS-232 settings are as follows:

   - Port: Com 1 or Com 2 as appropriate
   - Baud: 9600
   - Data Bits: 8
   - Stop Bits: 1
   - FlowControl: none

Running Command View SDM on the Serial Port

Starting the Command View SDM GUI

To start the Command View SDM GUI, from a command prompt type:

```
cmdviewva serial:comn
```

Replace *n* with the appropriate com port number. For example, to run the GUI on com port 2, type:

```
cmdviewva serial:com2
```

You will notice that the Performance tab and the Download tab are not available when using a serial port. These features are disabled when using a serial connection.

Starting the Command View SDM CLUI

The syntax for using the Command View SDM CLUI over a serial connection is unchanged except for the array addressing format. The array is addressed as `serial:com` *n*, where *n* is the appropriate com port number. For example, to run an armdsp command on com port 1, type:

```
armdsp -i serial:com1
```

If you attempt to use the `armperf` or `armdownload` commands, the command will fail with a "NOT BOUND IN REGISTRY" error. These features are not supported when using a serial connection.

index

Symbols

<component> **112**
<FruLocation> **112**
<subcomponent> **112**

A

access.dat file **62**
activating a LUN **116**
adding a new host **68**
advisory lock
  breaking using armmgr **152**
advisory lock, removing **128**
AIX **20**
alias **111**
  setting using armmgr **153**
armcfg command **115**
armcopy command **118**, **120**
armdiscover command **123**
armdownload command **126**
armdsp command **131**
armfeature command **141**
armfmt command **143**
armhost command **144**
armlog command **148**, **230**
armmgr command **150**
armperf command **159**
armrbld command **197**
armrecover command **199**
armsecure command **202**
armshell command **206**
array configuration
  restoring **61**
array reset
  using armmgr **156**
array,shutdown and restart
  using armmgr **156**
array-id
  structure of **111**
authorized clients
  access.dat file **62**
auto format
  setting using armmgr **153**
auto include
  setting using armmgr **153**
auto-rebuild
  setting using armmgr **152**

B

battery designator B1-B2 **112**
battery discharge cycle **136**
BMC Patrol **15**
business copy
  managing using armcopy **118**, **120**

C

CA Unicenter **15**
CA Unicenter TNG
  prerequisites **75**
cache, read
  setting using armmgr **156**
cache, write
  setting using armmgr **157**

capacity threshold
setting using armmgr **157**
checking array status
using the GUI **100**
client
access configuration **52**, **62**
HostAgent operation **67**
Windows **52**
command
conventions **110**
command summary
Command View **108**
command syntax **110**
Command View
installing on HP OpenView Storage Area Manager **49**
installing on HP-UX **44**
installing on Linux **55**
installing on Windows **49**
Command View SDM
command summary **108**
Command View VA user interface
see CVUI
commands
armcfg - configure array **115**
armcopy **118**, **120**
armdiscover - discover arrays **123**
armdownload - firmware download **126**
armdsp - display array information **131**
armfeature **141**
armfmt - format array **143**
armhost - manage host port behavior **144**
armlog - read array log entries **148**, **230**
armmgr - general array management **150**
armperf - array performance **159**
armrbld - rebuild data **197**
armrecover - data maps reconstruction **199**
armsecure - LUN security
armsecure
security, LUN **202**
armshell **206**
licapp **240**
licutil **242**
logdel - delete log files **228**
logprn - view logs **225**
CommandView
removing from HP-UX **47**
removing from Linux **58**
removing from Windows **54**
running on a serial port **249**
utilities **14**
configuration
client access **62**
client access for Windows **52**
displaying using armdsp
general **62**
configuring
the web server **63**
configuring the array
See armcfg command
controller designator C1-C2 **112**
controller firmware
downloading off-line or on-line **129**
controller log file **231**
controller logs **221**
creating LUN 0 **68**
creating LUNs **116**
CVUI
menu map **218**

starting

D

daemons
HostAgent **67**
OpenDIAL **67**
data rebuild
See armrbld command
deactivating a LUN **116**
deleting LUNs **117**
Designator **112**
device log See controller log
DIMM designator M1-M2 **112**
disabling security (GUI) **102**
discovery See armdiscover command
disk
auto include **153**
disk drive designator D1-D15 **112**
disk enclosure designator JA0-JA5 **112**
disk enclosure port designator J1-J2 **112**
display variable, setting **65**
downing a disk
using armcfg **116**
download firmware See armdownload
downloading firmware
on-line or off-line **129**

E

EMS
enabling **64**
enabling EMS **64**
enabling security (GUI) **102**
event reporting **15**
event viewer **15**

F

fibre channel
resetting using armmgr **152**
return default settings **153**
files, special
access.dat **62**
authorized clients **62**
firewall **87**
firmware
download See armdownload command
downloading on-line or off-line **129**
VA 7410 version numbering **128**
firmware files **128**
where to find **128**
firmware, controller
downloading off-line or on-line **129**
format array
See armfmt command **143**
FRU location **112**
FRU, identifying **153**

G

GBIC designator G1-G2 **112**
GUI
checking array status **100**
management settings **100**
managing array capacity **100**
managing host port behavior table **104**
managing LUN security **102**
starting from
command line **94**
command line launcher **93**
OpenView SAM **95**
web browser **94**
through a firewall **87**
using **96**

H

host port behavior
  file, creating **144**
  setting using armmgr **152**
host port designator H1-H2 **112**
HostAgent
  client operation **67**
hostagent
  installing on OpenView SAM **52**
hostname **111**
hot spare mode
  setting using armmgr **153**
hots port behavior table
  managing using the GUI **104**
HP EMS **15**
HP OpenView SAM
  authorized clients **62**
HP-UX
  installing Command View **44**
  minimum system requirements **44**
  patches **44**
  software support **48**

I

identifying FRUs
  using armmgr **153**
installation
  overview **39**
installation, verifying **66**
installing Command View
  on HP-UX **44**
  on Linux **55**
  on Windows **49**
IP addresses
  multiple
    HP-UX **45**
    Linux **55**
    Windows **49**

J

JBOD. See disk enclosure

L

LED, flashing **153**
License
  commands **239**
    licapp **240**
    licutil **242**
Linux
  installing Command View **55**
  minimum system requirements **55**
log
  entry format **232**
  files **231**
  management commands **224**
log files
  managing the size of **223**
logdel command **228**
logprn command **225**
logs
  armlog command **230**
  controller **221**
  controller file **231**
  logdel command **228**
  performance **233**
  port statistics **233**
  usage (state) **221**
  usage log **231**
logs, reading
  See armlog command
LUN
  activating/deactivating **116**
  creating **116**
  deleting **117**
LUN 0, creating **68**

M

management
logs **224**
management, array
See armmgr command
managing array capacity
using the GUI **100**
managing host port behavior table
using the GUI **104**
managing LUN security
using the GUI **102**
map reconstruction
See armrecover command
memory designator MP1 **112**
metrics, performance **162**
minimum system requirements
HP-UX **44**
Linux **55**
Windows **49**
modular storage software products **18**
MP1 **112**
MPE/iX **20**

N

NetWare **20**
new host, adding to management configuration **68**
non-native operating systems **20**
NVRAM, disabling **157**

O

OpenDIAL
client operation **67**
OpenView NNM **15**
OpenView SAM
armdiscover command operation **123**
array identifier use **111**
installation tips **50**
installing HostAgent **52**
management configuration **43**
starting GUI from **95**
OpenVMS **20**
operating systems
non-native **20**
other products **18**

P

password
security, arm secure, resetting **204**
user default **89**
patches, HP-UX **44**
performance
See armperf command
performance log files
managing the size of **233**
performance metrics **162**
performance, logs **233**
PM1 **112**
port statistic log **233**
power supply designator P1-P2 **112**
prerequisites
CA Unicenter TNG **75**
problem solving **245**

Q

queue full threshold
setting using armmgr **156**

R

read cache
setting using armmgr **156**
rebuilding device database
when renaming a host **70**
reinstalling CommandView
HP-UX **47**
Linux **58**

Windows **54**
removing an advisory lock **128**
removing CommandView
HP-UX **47**
Linux **58**
Windows **54**
renaming a host **69**
reset
fibre channel **152**
resetting array
using armcfg **116**
resetting the array
using armmgr **156**
resilience level
setting using armmgr **154**
restart array **156**
restoring array configuration **61**

S

security
armsecure command **202**
LUN
armsecure command **202**
password
armsecure command **204**
default user **89**
user
configuring **88**
default password **89**
enabling **88**
login screen **93**
serial number **111**
serial port
running CommandView on **249**
services
HostAgent **67**
OpenDIAL **67**
setting display variable **65**
shutdown array **156**
SNMP applications **15**
Solaris **20**
solving problems **245**
state log See usage log
status, reporting
See armdsp command
support
HP-UX software **48**
technical **22**

T

Tivoli **15**
TopTools **15**
Tru64 **20**

U

uninstall
See removing
uninstall See removing
UPS
disabling NVRAM when not present **157**
usage log file **231**
usage logs **221**
utilities, CommandView **14**

V

VA 7410
firmware version numbering **128**
verifying installation **66**
VFP **14**
virtual front panel **14**

W

web server, configuration **63**
Windows
installing Command View **49**
minimum system requirements **49**
World Wide Name See WWN

write cache
setting using armmgr **157**
WWN **111**